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OPERATION AND MAINTENANCE MANUAL

TRANSCEIVER HF/SSB SYNTHESIZED HALF-DUPLEX SECURE CHANNEL

GSB-900 SC

sunair electronics, inc.
3101 S. W. 3rd Avenue,
Fort Lauderdale, Florida 33315 USA

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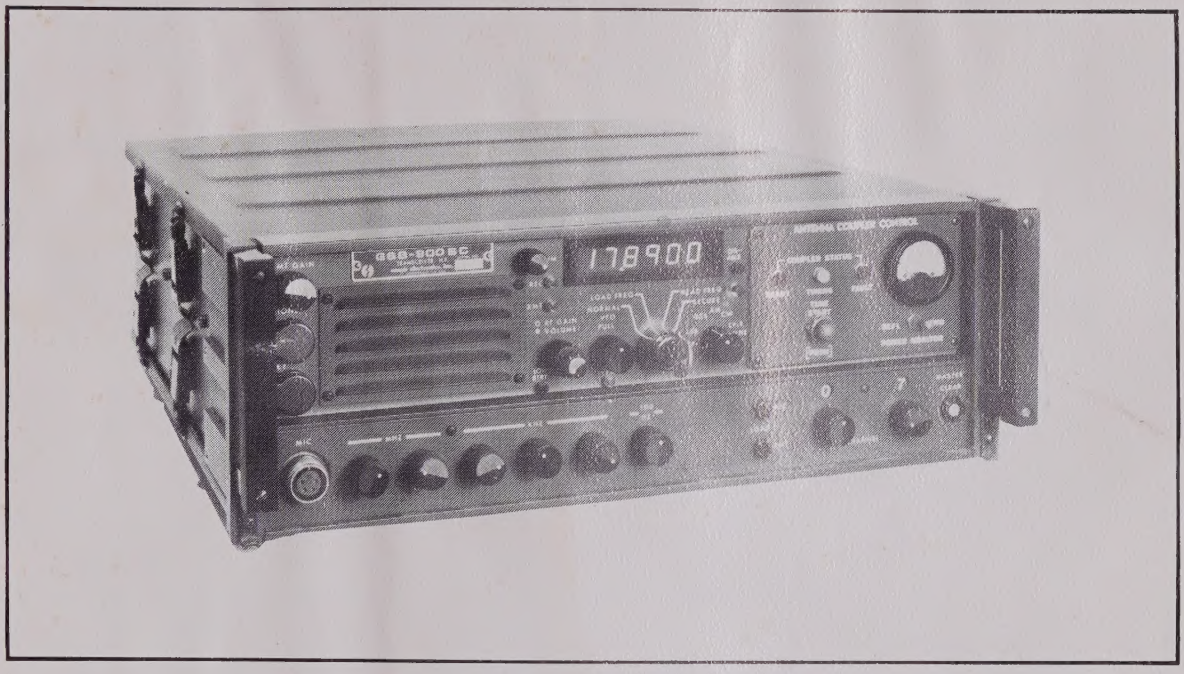

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TRANSCEIVER HF/SSB SYNTHESIZED HALF-DUPLEX SECURE CHANNEL

GSB-900SC

NOTICE
Important equipment information may be contained in the addendums located in the last section of this manual.

SECOND EDITION MARCH 1980
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SECTION 1
GENERAL INFORMATION

1.1 SCOPE

This instruction manual contains the necessary information to install, operate and service the GSB-900SC Transceiver.

1.2 TRANSCEIVER DESCRIPTION

1.2.1 GENERAL

The GSB-900SC is a high quality single sideband transceiver with a field programmable memory system providing storage capacity for 100 channels of transmit and receive frequencies in the range from 1.6000 to 29.9999 MHz. Any channel is capable of functioning as a simplex channel (identical transmit and receive frequency) or as a half-duplex channel (dissimilar transmit and receive frequencies). Knowledge of the operating frequencies stored in each of the channels may be restricted using the lockable Secure position of the Frequency Control Mode keylock switch. Transceiver modes of operation are standard and include Lower Sideband (LSB), Upper Sideband (USB), Amplitude Modulation (AM) and Continuous wave (CW). Operation in the Frequency Shift Keying (FSK) and Facsimile (FAX) Modes are also possible with the addition of suitable modems. The transceiver is mechanically and electrically designed to meet stringent military specifications for shock, vibration and protection from outside environments. The unit is completely sealed (dust free) utilizing neither blowers nor ventilating louvers, making it ideal for mobile as well as base station use. It can operate over wide temperature extremes (-30 to + 65 C) and up to 100% relative humidity.

The GSB-900SC is composed of seven major subassemblies, (1) front panel 1A1, (2) antenna coupler control panel 1A2 (optional), (3) receiver/exciter 1A3, (4) synthesizer 1A4, (5) filter module 1A5, (6) power supply 1A6, (7) power amplifier 1A7. See Figure 1.1 for major assembly location.

1.2.2 FRONT PANEL - 1A1

The Secure Channel front panel contains the standard controls for operation of the transceiver in Lower Sideband (LSB), Upper Sideband (USB), Amplitude Modulation (AM) and Continuous Wave (CW) modes. The panel contains a memory system permitting storage of 100 different transmit frequencies and 100 different receive frequencies. A Load Xmt pushbutton and a Load Rec pushbutton are located on the front panel to permit easy field programming of any transmit or receive frequency in any of the 100 channels available for that purpose. Each channel is accessible using the front panel Channel selector switches.

Any channel may store either a transmit and a receive frequency that are identical (simplex operation) or a transmit and a receive frequency that are different (half-duplex operation). The front panel includes a Frequency Control Mode keylock switch that permits storage of new frequencies into the memory system as well as utilization of the stored frequencies as radio operating frequencies. In addition, the Frequency Control Mode keylock switch permits operation of the transceiver in a locked security mode by blanking the six digit front panel frequency display and restricting knowledge of the operating frequencies. The Frequency Con-

trol Mode keylock switch also permits operation in a conventional control mode employing the six front panel frequency switches to select the operating frequency. Included on the front panel is a Master Clear pushbutton which provides the ability to instantaneously erase all frequencies in memory in the event that all records of operating frequencies require quick destruction. The memory system is composed of two P.C. boards on a mother board, a six digit display, two batteries and a power supply all mounted to the front panel. High reliability of the memory system is provided through the extensive use of both digital and linear integrated circuits.

1.2.3 ANTENNA COUPLER TUNING CONTROL UNIT – 1A2 (optional)

This unit plugs into the front panel and contains all controls necessary to remotely operate an antenna coupler. Tuning status of the coupler is monitored by the meter installed in the tuning unit panel. When the GSB-900SC is operated into a 50 ohm antenna and the coupler is not installed, the transceiver is supplied with a meter panel which indicates receive signal strength and relative power output of the transmitter.

1.2.4 RECEIVER/EXCITER – 1A3

The Receiver/Exciter module contains the low level signal generation circuitry. The 1st I.F. frequency is well above the 30 MHz upper limit of the transceiver-providing the unusually high spurious signal rejection found only in this modern frequency scheme. The extensive use of integrated circuits provides an unusually high level of uniformity and reliability. High quality crystal filters are employed both in the "front end" of the radio and in the I.F. section for sideband selection. The Receiver/Exciter is fully contained on four plug-in printed circuit boards plus a mother board and employs fully modularized construction.

1.2.5 SYNTHESIZER – 1A4

Frequency control is by means of a digital frequency synthesizer providing 100 Hz frequency steps. In addition, the operator can select a high stability VFO mode of operation, which provides continuous tuning between the 100 Hz synthesized increments. All frequencies in the transceiver are derived from a Temperature Compensated Crystal Oscillator (TCXO) which provides instant on-frequency operation with no warmup. The frequency stability is better than $\pm 1 \times 10^{-6}$ over the full specified ambient temperature range of the radio. The long term stability is $\pm 5 \times 10^{-7}$ per year; permitting long intervals between calibration.
The Synthesizer is fully modularized for ease of maintenance. High reliability is assured through the extensive use of both digital and linear integrated circuits. The Synthesizer is fully contained on five plug-in printed circuit boards plus a mother board.

1.2.6 FILTER MODULE - 1A5

The filter module is contained on four P.C. boards and is housed in a removable unit. Filter selection is automatically accomplished by front panel memory system outputs which control a D.C. motor. High power low pass filters are used in the transmit mode to remove all unwanted harmonics from the power amplifier output. In the receive mode high pass networks are switched in the filter which in conjunction with the low pass filters yield a bandpass filter. This module also contains circuitry for control and protection of the power amplifier.

1.2.7 POWER SUPPLY – 1A6

The GSB-900SC will operate from power sources of 115 or 230 volt 50-60 Hz A.C. and in addition from 13 or 26 volt D.C. sources (either positive or negative ground) with the optional, self contained, D.C. module. The same transceiver can operate

from both A.C. and D.C. power sources, with the D.C. Module installed, by changing the external power input cable. The selection of 13 or 26 volt D.C. operation is easily accomplished by changing connections on a jumper strip in the power supply. The power supply employs fully modularized construction for ease of maintenance.

1.2.8 RF POWER AMPLIFIER –1A7

The GSB-900SC contains an all solid state broadband power amplifier which will match 50 ohm loads with voltage standing wave ratios (V.S.W.R.) under 2:1 over the entire frequency range of the radio with no additional operator tuning. Adequate cooling is provided by a conservatively rated heat sink at the rear of the radio. The power amplifier is rated at 100 watts peak envelope power (P.E.P.) and 100 watts average power over the entire frequency range. The power amplifier incorporates Automatic Level Control (ALC) which limits the peak power output to 100 watts while increasing the average power with highly varying speech inputs. The ALC also prevents the increase in intermodulation distortion caused by "flat topping" in the P.A. and alleviates the usual critical setting of the transmit gain control. The P.A. employs circuits to protect the amplifier under excess V.S.W.R. or other abnormal conditions. In the A.M. mode, an Automatic Carrier Control (ACC) circuit is engaged which controls the amount of A.M. power output. The power amplifier is easily removable (as a module) from the rear of the radio.

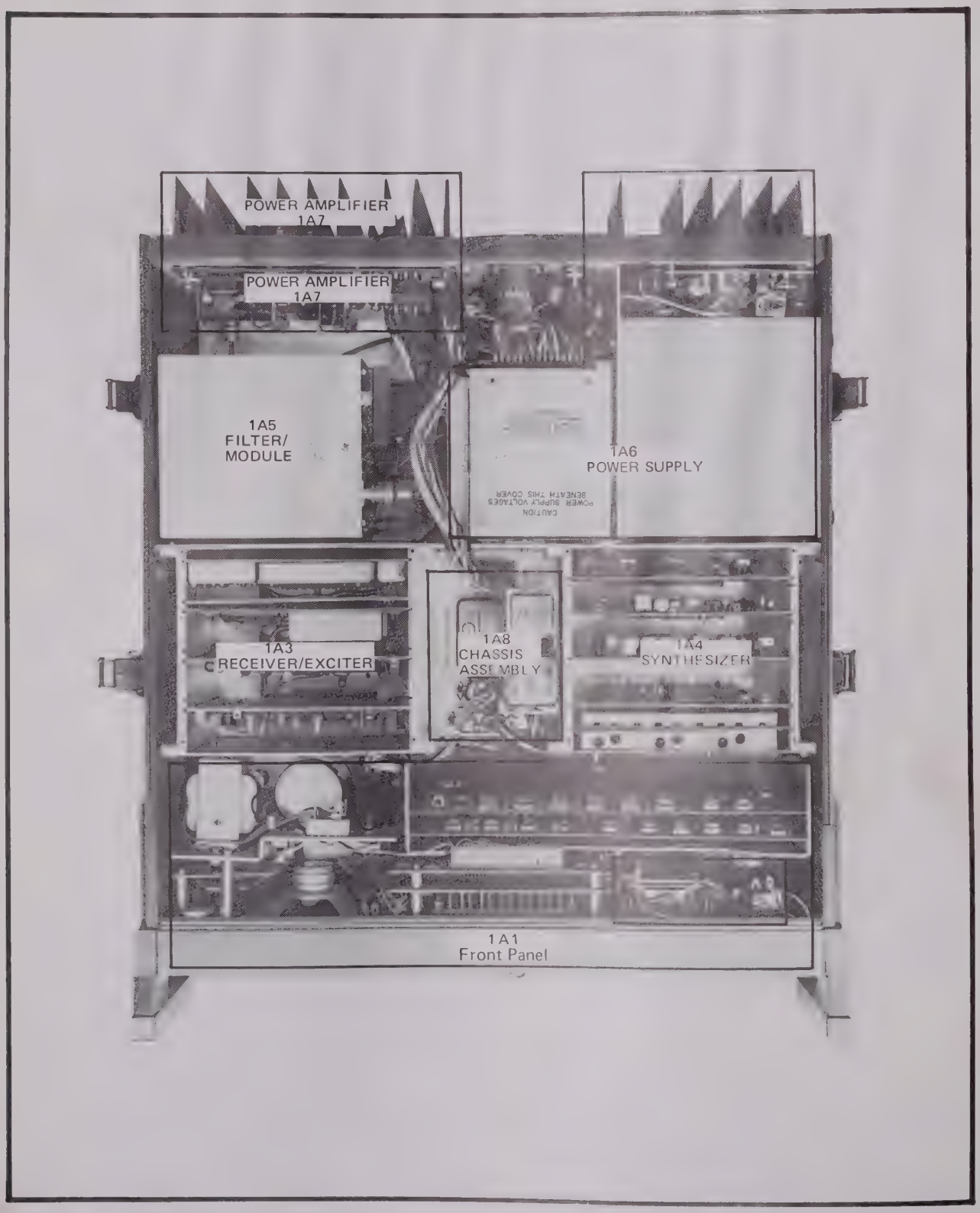


Figure 1.1 GSB-900SC Major Assembly Locations

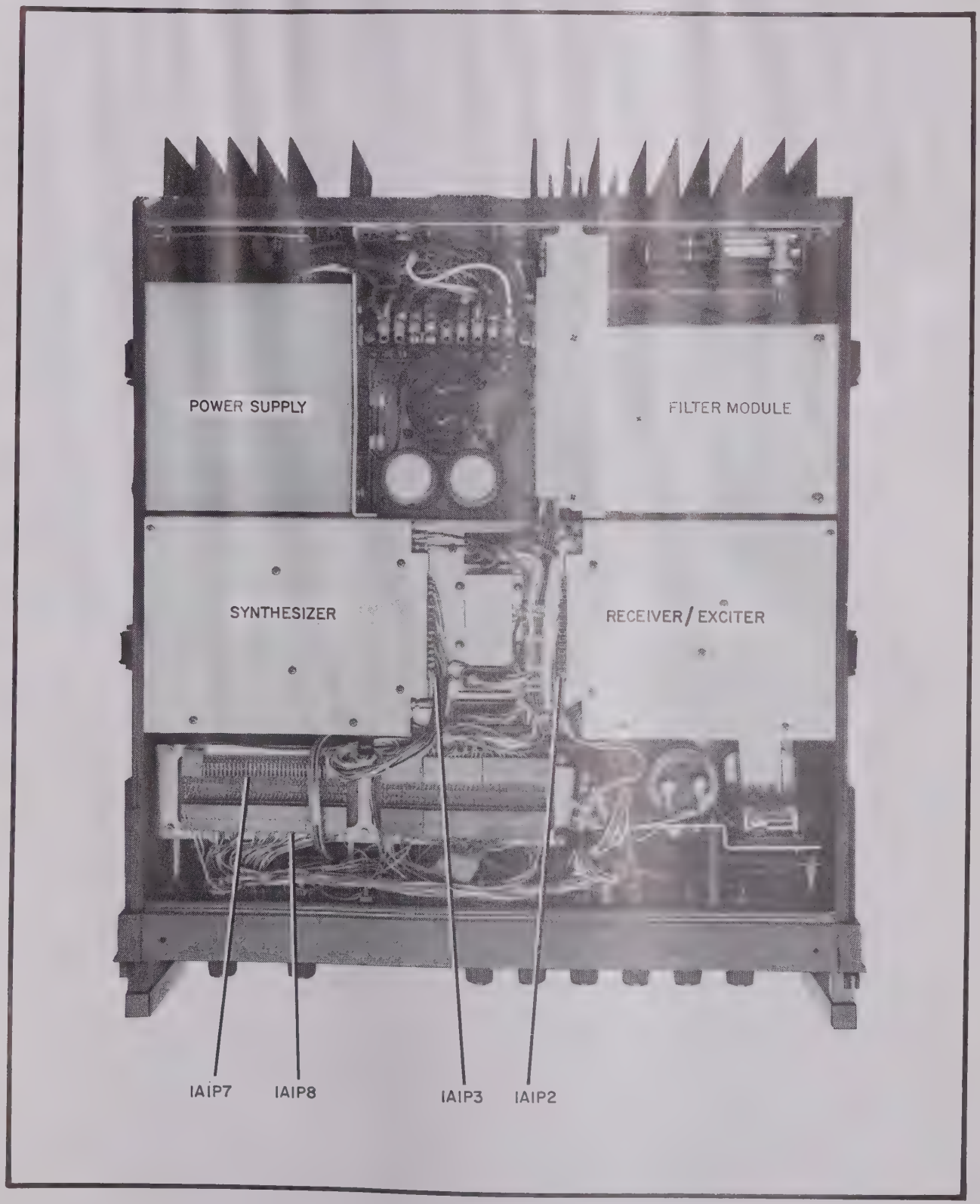


Figure 1.2 GSB-900SC Bottom View

1.3 TECHNICAL SPECIFICATIONS

Electrical and physical specifications of the Sunair GSB-900SC Transceiver are listed below.

1.3.1 GENERAL

FREQUENCY RANGE: 1.6 to 29.9999 MHz (100 Hz increments, plus VFO).

PROGRAMMABLE FREQUENCIES AVAILABLE: 284,000, synthesized.

STORED CHANNELS: 100 (Channel 00 thru Channel 99, Simplex or Half-Duplex).

MEMORY LOCATIONS PER CHANNEL: 2

TOTAL MEMORY LOCATIONS: 200.

FREQUENCY OPERATING MODES: Normal, Load Freq, Read Freq, Secure.

RESOLUTION: Digital, direct readout (100 Hz steps, plus VFO).

FREQUENCY STABILITY: $\pm 1 \times 10^{-6}$ TCXO, over rated temperature range.

OPERATING MODES: USB, LSB, AME, CW, (FSK and FAX with external optional modems).

RF INPUT/OUTPUT IMPEDANCE: 50 ohms nominal, unbalanced.

DUTY CYCLE: Continuous.

ENVIRONMENTAL TEMPERATURE: -30°C to $+65^{\circ}$C, for 100 watts PEP output. -30° to $+50^{\circ}$C, for 100 watts Average (Continuous FSK). External blower kit required for continuous FSK service.

HUMIDITY: 100% at 50°C.

SHOCK: Per MIL-STD-810B, Method 516.1, Procedure I, Fig. 516.1.2, Amplitude a Duration c.

VIBRATION: Per MIL-STD-810B, Method 514.1, Procedure VIII, Curve V.

ENCLOSURE: Per MIL-STD-108, table II. (Splashproof).

METER MONITORS: Relative power output, received signal strength.

FRONT PANEL CONTROLS: Digital Frequency Selectors, Digital Channel Selectors, Frequency Control Mode Keylock Switch, Load Receive Pushbutton, Load Transmit Pushbutton, Master Clear Pushbutton, VFO, Volume, Mode/on-off, RF Gain, Transmitter Gain, Light Dimmer, and optional plug-in antenna coupler control panel.

POWER INPUT: AC: 115/230 volts ±15%, 50-60 Hz; at 400 watts max.
DC: (optional) 13/26 volts, ±10%; at 480 watts max.

DIMENSIONS: (CM) 15.2H x 46.6W x 53.7 D
(INCHES) 6H x 18.25W x 21.125D

WEIGHT: 30 kgs. (66 pounds)

1.3.2 RECEIVER

SENSITIVITY:
(2-30 MHz) — SSB: 0.5 uv into 50 ohms for 10 db S+N/N.
AM: Not more than 3.0 uv into 50 ohms for 10 db S+N/N.
(1.6 to 2.0 MHz) 6db degradation.

AUDIO OUTPUT: 5 watts into 8 ohms (speaker) @ less than 10% distortion; 10 dbm nominal into 600 ohms (internally adjustable).

SELECTIVITY: 300 to 3000 Hz nominal (6db points), standard.

IF REJECTION: Not less than 70 db.

IMAGE REJECTION: Not less than 80 db.

AGC: Fast attack, slow release. Threshold 5 uv nominal, 15 db max audio change for 100 db R.F. input change.

INTERNAL SPURIOUS RESPONSE: 99.5% below equivalent 0.2 uv noise input at antenna terminals.

EXTERNAL SPURIOUS RESPONSE: -65 db, non-harmonically related.

1.3.3 TRANSMITTER

POWER OUTPUT: SSB: 100 watts PEP and average nom.
CW: 100 watts Avg. nom.
AME: 30-40 watt carrier.

HARMONIC SUPPRESSION:
-40 db, second harmonic.
-50 db, all other harmonics.
-60 db, all harmonics, (with antenna coupler)

INTERMODULATION DISTORTION: At least 33 db below PEP., typical.

CARRIER SUPPRESSION: 50 db.

UNDESIRED SIDEBAND SUPPRESSION: 50 db at 1.5 kHz.

HUM AND NOISE LEVEL: -50 db.

1.4 EQUIPMENT SUPPLIED

The following table is a list of equipment, with their appropriate Sunair part numbers, supplied with the GSB-900SC Transceiver.

		Sunair Part No.
1.4.1	Transceiver, GSB-900SC with 115/230 volt power supply.	1004000014 Green 1004000031 Gray
1.4.2	Hand Held Microphone Assembly	5024000609
1.4.3	Operating Manual	1004190000
1.4.4	Power Cord Assembly, 115 V A.C. OR Power Cord Assembly, 230V A.C.	5024002091 5024002156
1.4.5	Ancillary Kit, consisting of: Extender cards (to service P.C. boards) Spare bulbs Tuning tools.	1004010001

1.5 OPTIONAL EQUIPMENT-NOT SUPPLIED

The following table of accessories and spares are NOT supplied but are made available by Sunair Electronics, Inc. as compatable equipment for the GSB-900SC. Part numbers and descriptions are given to facilitate ordering.

1.5.1	Antenna Coupler, Remote Controlled, GCU-910A	5024200055 5024200098	Gray Green
1.5.2	Automatic Antenna Coupler, GCU-935	6035000096 6035000053	Green Gray
1.53	Control Cable for GCU-910A or GCU-935 (specify length)	0588680001	
1.5.4	Antenna Coupler Tuning Control (mounts in Front Panel of GSB-900SC to control item 1.5.1). Supplied with antenna coupler. Refer to 1.5.1.	5024042352 5024042395	Gray Green
1.5.5	Coaxial Cable, type RG58/U (recommended for connecting antennas to the GSB-900SC , or for connecting the GSB-900SC to the GCU-910 or GCU-935 where the length will be under 100 feet). SPECIFY LENGTH	0588130001	
1.5.6	Coaxial Cable, type RG8/U (same as 1.5.5 above, but recommended where length will exceed 100 feet). SPECIFY LENGTH	0586640000	
1.5.7	D.C. Inverter Module (Powers the GSB-900SC from either 13 or 26 volt D.C. sources while still permitting operation from 115/230V A.C. mains). Module mounts inside GSB-900SC.	5024021304	
1.5.8	Power Cord Assembly-D.C. (includes 10 feet of connecting cable). For use with item 1.5.7 above. (Supplied with DC inverter above).	5024002296	
1.5.9	C.W. Key (includes 3 foot cable and connector).	5024000994	
1.5.10	Handset Assembly (with coiled cord and connector).	5024000790	
1.5.11	Headset (includes cable and connector).	0840200005	

1.5.12 Desk Type Microphone (includes cable and connector).	5024000897
1.5.13 Shock Mount Assembly (recommended for mobile applications).	1001680006
1.5.14 Rack Mount Kit (adapts GSB-900SC to mount in a standard 19 inch rack). Includes rack slides.	1001690001
1.5.15 Doublet Antenna Kit	0996240000
1.5.16 75 foot Long Wire Antenna Kit	0999200003
1.5.17 150 foot Long Wire Kit	0999210009
1.5.18 16 foot Mobile Fiberglass Whip Antenna (use with 1.5.19 below).	0712950001
1.5.19 Heavy Duty Strap-Type Bumper Mount for 1.5.18 above.	0715730002
1.5.20 Heavy Duty Feed Thru Mount (for 1.5.18 above).	5024402090
1.5.21 Right Angle Vehicular mount for 1.5.18 above.	5024402596
1.5.22 35 foot Fiberglass Base Station Whip Antenna.	0715850008
1.5.23 23 foot Fiberglass Marine Whip Anten -na with Flange Base.	0715760009
1.5.24 23 foot Fiberglass Marine Whip Antenna.	0712980008
1.5.25 Laydown Mount for above.	0712990003
1.5.26 Depot Spare Parts Kit for GSB-900SC (to support 3 to 5 units in the field for 2 to 4 years).	1001670001
1.5.27 Depot Spare Parts Kit for GCU-910A Antenna Coupler.	5024900693
1.5.28 Depot Spare Parts Kit for GCU-935 Antenna Coupler	6035900097

1.5.29 Field Module Kit for GSB-900 SC (contains p-c board assemblies).	1004030002
1.5.30 GRC-951 Remote Audio/Keyline Control for GSB-900SC.	5024850092
1.5.31 Remote Control Cable for GRC-951 (specify length).	0588690007
1.5.32 Depot Spare Parts Kit for GRC-951.	5024901592
1.5.33 Depot Spare Parts Kit for D.C. Inverter Module.	5024902092
1.5.34 Blower Kit 115 VAC (mounts on rear panel).	5024-006089
1.5.35 Blower Kit 220 VAC (Mounts on rear panel).	5024-0060-97
1.5.36 Manual Phone Patch Assembly (See Page 6-1 for description).	5024400003

SECTION 2

INSTALLATION

2.1 GENERAL

Section two contains all necessary instructions for the unpacking, inspection, and if necessary, reshipping of damaged equipment or parts. In addition, further information regarding location and mounting considerations, power requirements, antenna and ground system hook-ups and final checkouts after installation are also provided.

2.2 UNPACKING AND INSPECTION

Unpack and inspect all parts and equipment as soon as received.

NOTE

Be sure to retain the carton and it's associated packing materials should it be necessary to reship damaged equipment.

Do not accept a shipment where there are visible signs of damage to the cartons until a complete inspection is made. If there is a shortage or any evidence of damage is noted, insist on a notation to that effect on the shipping papers before signing the receipt from the carrier.

If concealed damage is discovered after a shipment has been accepted, notify the carrier immediately in writing and await his inspection before making any disposition of the shipment. A full report of the damage should also be forwarded to Sunair. Include the following:

(a) Order number
(b) Model and serial number
(c) Name of transportation agency

When Sunair receives this information, arrangements will be made for repair or replacement.

2.3 RESHIPPING

The shipping carton for the GSB-900SC has been carefully designed to protect the transceiver and its accessories during shipment. This carton and its associated packing materials should be used to reship the radio.

If the original shipping carton is not available, be sure to carefully pack each unit separately, using suitable cushioning material where necessary. Very special attention should be given to providing enough packing material around controls, connectors, and other protrusions from the radio. Rigid cardboard should be placed at the corners of the equipment to protect against denting.

When returning one or more subassemblies for repair, you must ship AIR PARCEL POST consigned to:

SUNAIR ELECTRONICS, INC.
3101 SW 3rd Avenue
Ft. Lauderdale, Florida 33315
U.S.A.

Plainly mark with indelible ink all mailing documents as follows:

U.S. GOODS RETURNED FOR REPAIR
VALUE FOR CUSTOMS - $100.00

and be sure to mark on all sides of the package

"FRAGILE - ELECTRONIC EQUIPMENT"

NOTE

Before shipping, carefully inspect the package to be sure it is marked properly and is securely wrapped.

2.4 GENERAL INSTALLATION AND MOUNTING INFORMATION

General installation procedures and mounting requirements are given for the GSB-900SC transceiver. Satisfactory operation of this equipment will depend upon the care and thoroughness taken during installation.

2.4.1 GENERAL INSTALLATION

a. Carefully plan radio/coupler/antenna locations, observing the following requirements before starting installation.

b. Provide best possible RF ground for radio and coupler. Use flat copper strap 1" wide or no. 6 or larger wire and connect to ground terminal at rear of transceiver. Leads to ground system should be as short as possible.

c. Provide maximum separation between coupler output and the radio with its associated wiring. Coupler may be mounted 100 ft. from radio if RG58 rf cable is used, or further if RG8 is used.

d. Antenna lead from antenna coupler to antenna must be insulated for at least 10kv potential. The lead should not run parallel to metal fittings or other metal objects that are bonded to the system ground. The coupler should be as close to the antenna as possible, and never more than 3 ft. distant as this will decrease antenna efficiency.

e. If the radio is installed on a wood or fiber glass boat, approximately 10 to 12 square feet of metal surface area in contact with the water should be provided for use as an RF ground.

f. If operated on D.C. power, check for correct polarity before applying power.

g. The installation should be carefully planned beforehand in accordance with drawings on the following pages.

h. Linear amplifiers with low level modulation such as used in the GSB-900SC will oscillate if the RF power output is radiated or conducted into the low level stages. Evidence of this situation is erratic or excessive power output. This is caused by too close proximity of the coupler output and antenna to the transmitter and/or inadequate RF grounds. Carefully following the above procedures will prevent this from occuring.

2.4.2 BASE STATION INSTALLATION

The transceiver is equipped with rubber feet so that it can be set directly on a table, desk or similar flat surface. The front feet are longer than the rear feet in order to tilt the transceiver at a convenient operating angle. Minimum clearances of 1 inch at the sides and 2 inches at the rear and top should be allowed to provide for adequate cooling of the rear panel heat sinks. If extended periods of RTTY transmission are anticipated, forced air cooling of the heat sinks is recommended. Figure 2.1 shows the applicable GSB-900SC outline dimensions for use in this installation. Figures 2.2 and 2.3 show typical Base Station system installations. Refer to section 2.5 for recommendations of suitable antennas. See section 2.4.5 for rack mounted installations.

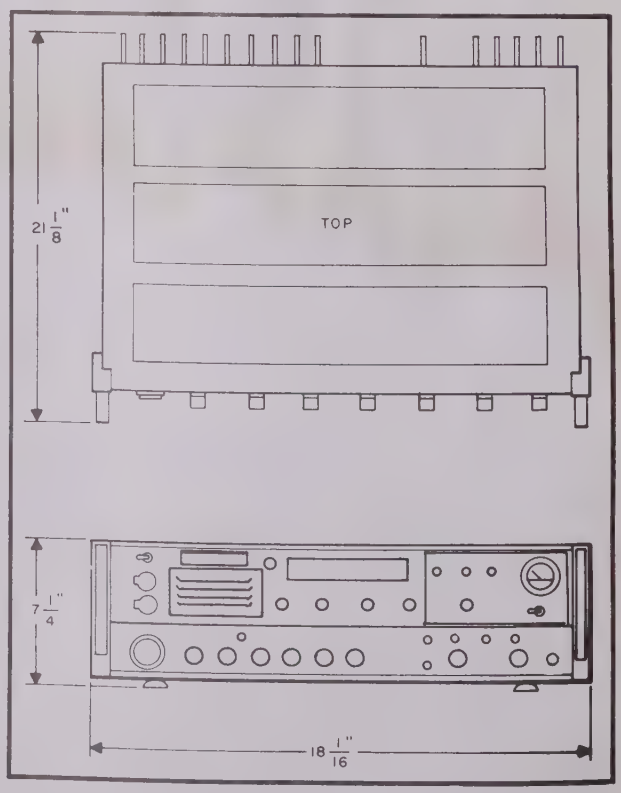


Figure 2.1 Outline Configuration

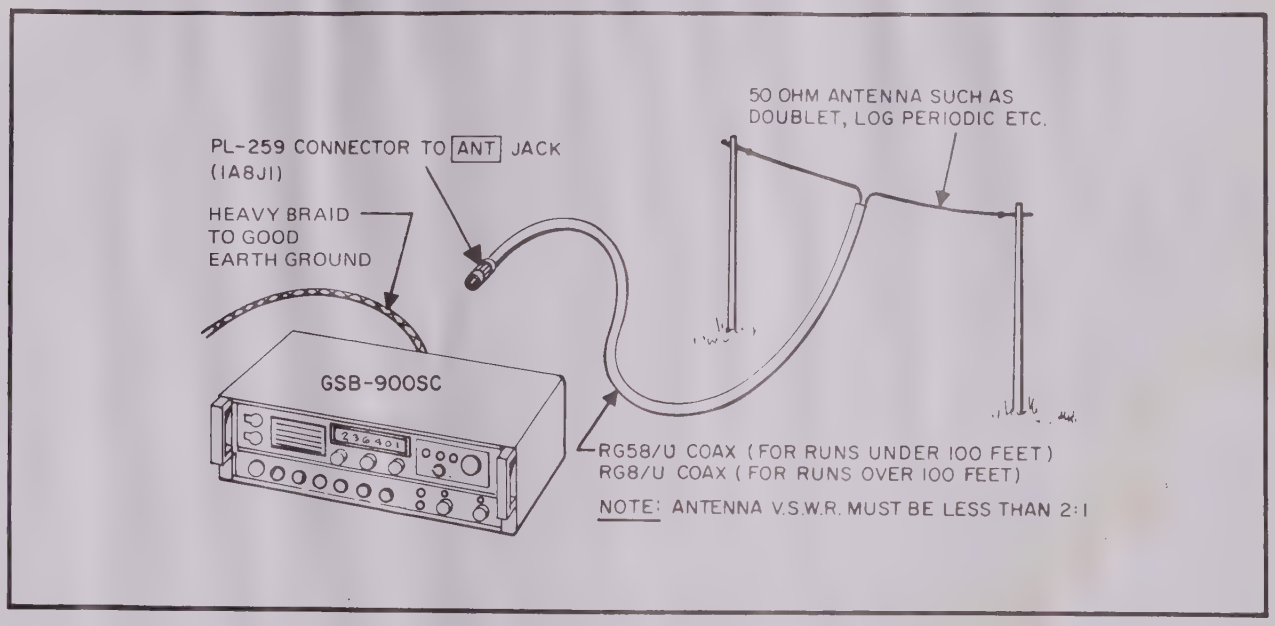

50 OHM ANTENNA SUCH AS
DOUBLET, LOG PERIODIC ETC.
PL-259 CONNECTOR TO ANT JACK
(1A8J1)
HEAVY BRAID
TO GOOD
EARTH GROUND
GSB-900SC
RG58/U COAX (FOR RUNS UNDER 100 FEET)
RG8/U COAX (FOR RUNS OVER 100 FEET)
NOTE: ANTENNA V.S.W.R. MUST BE LESS THAN 2:1

Figure 2.2 Base Station Installation (50 ohm Antenna)

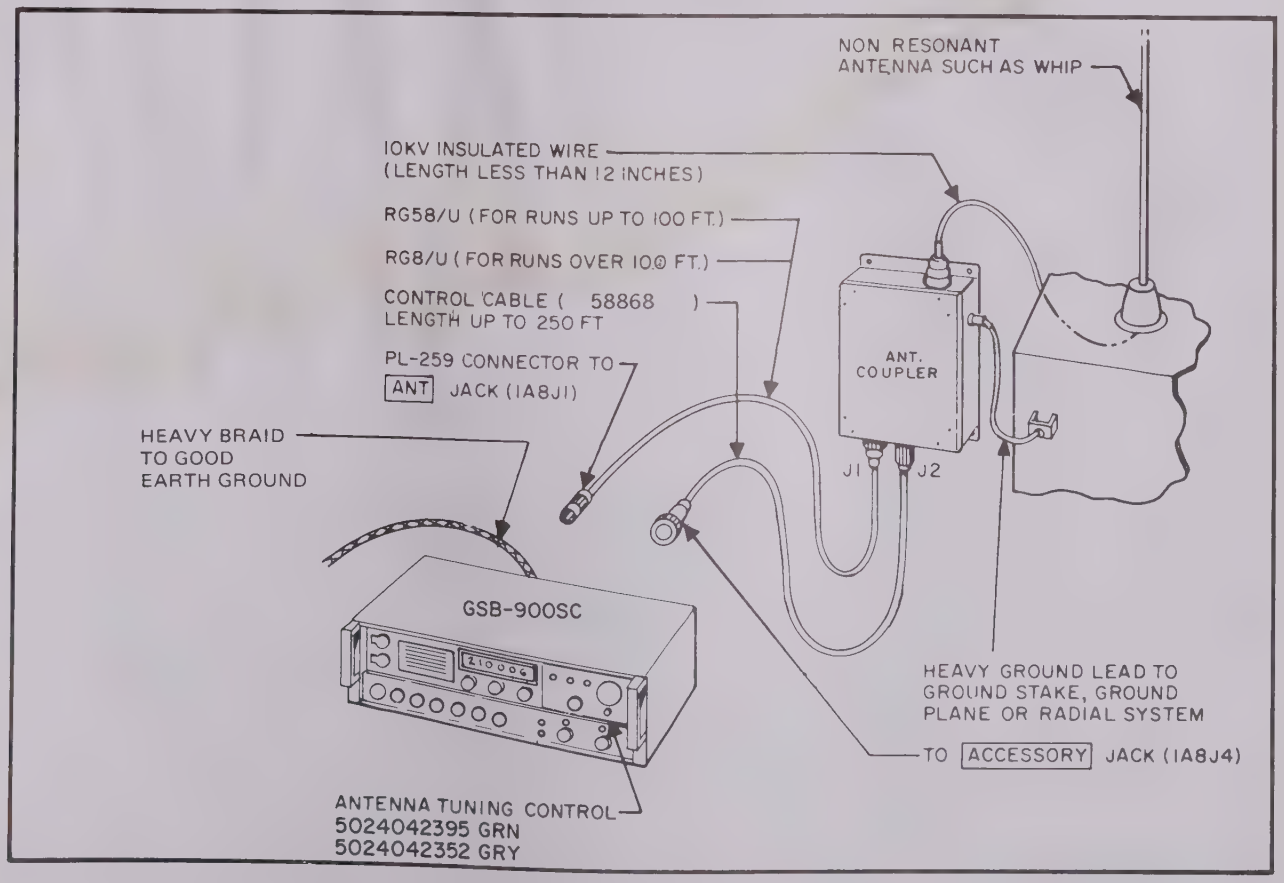


Figure 2.3 Base Station Installation (Non-Resonant Antennas)

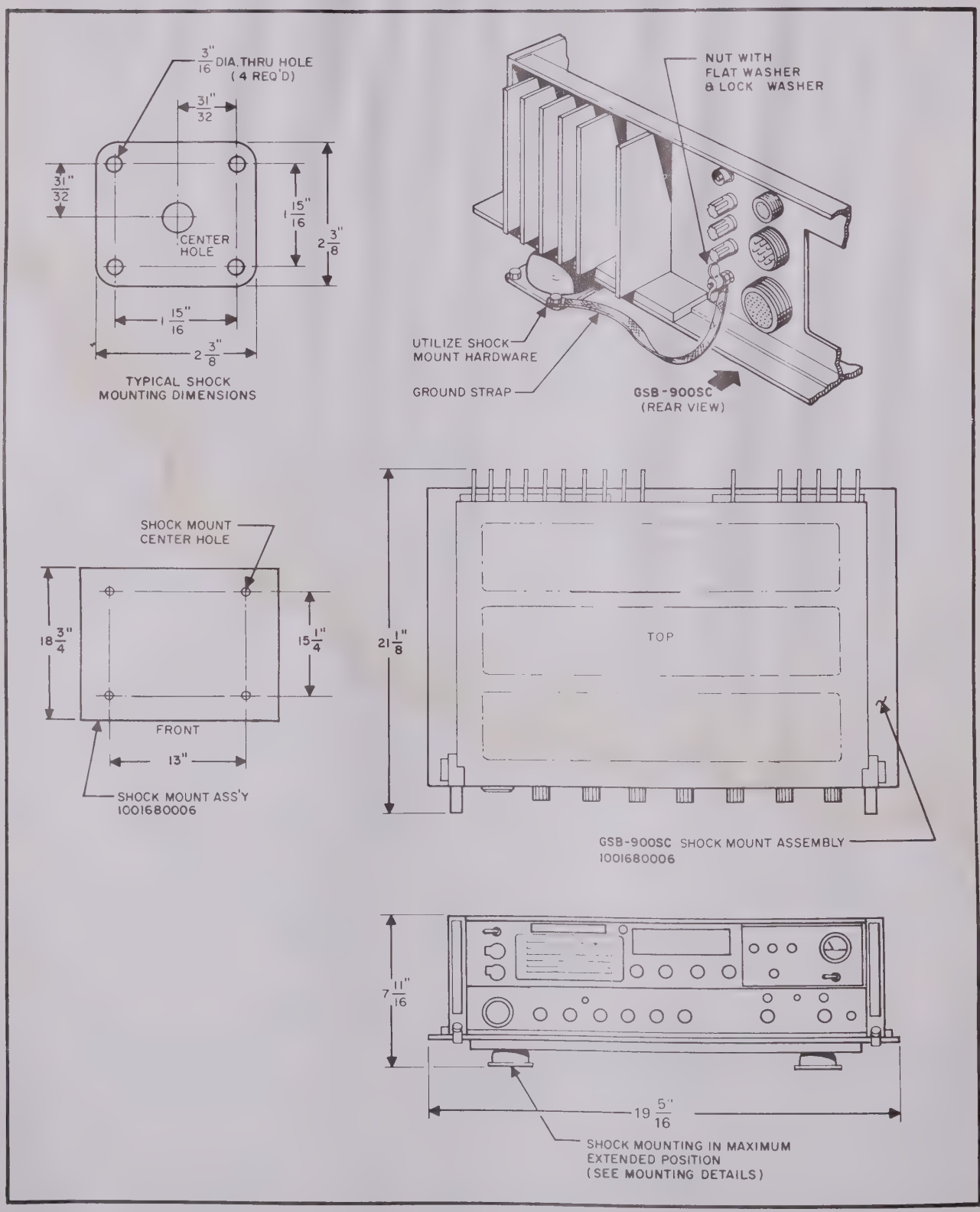


Figure 2.4 Shock Mount Assembly and Details

2.4.3 VEHICULAR INSTALLATIONS

The GSB-900 SC Shock Mount Assembly (Sunair Part No. 1001680006) is designed to mount the Transceiver in vehicular installations. Figure 2.4 gives the applicable outline dimensions for the GSB-900SC coupled with the shock mount. Figure 2.5 shows a typical vehicular installation. See section 2.5 for specific antenna recommendations. In order to minimize R.F. pickup, it is important that the ground strap supplied with the shock mount be securely fastened between the ground post on the radio and the bottom of the right rear shock isolator (see detail, figure 2.4). It is also important to ground the antenna coupler to the frame of the vehicle by the shortest possible path.

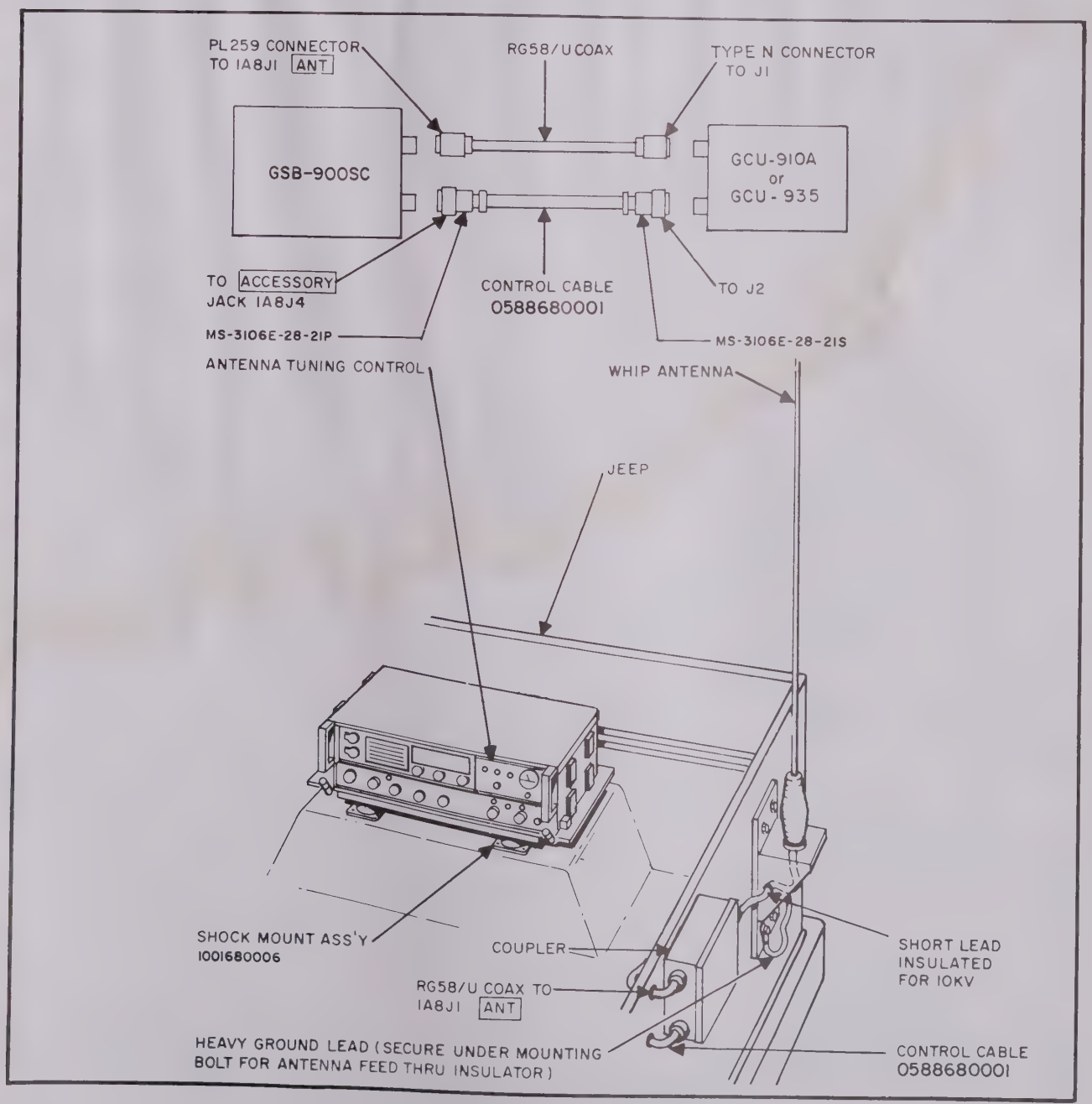


Figure 2.5 Typical Vehicular Installation

2.4.4 MARINE INSTALLATIONS

In marine installations, follow the same recommendations as outlined in paragraph 2.4.3. If the radio is installed in a wood or fiberglass boat, a ground plate of 12 square foot minimum area in contact with the water should be installed. A heavy ground lead such as 1 inch wide strap or braid should be connected between the ground post on the radio and the ground plate. The length of this ground lead should be held to an absolute minimum commensurate with a neat installation.

2.4.5 RACK MOUNTED INSTALLATIONS

The GSB-900SC may be conveniently mounted in a standard 19 inch rack using the Rack Mount Kit (1001690001).The kit includes a pair of rack slides, associated hardware and filler panel. The GSB-900SC, in the rack mounted configuration, requires a standard panel space seven inches high. Refer to figure 2.6 for assembly details.

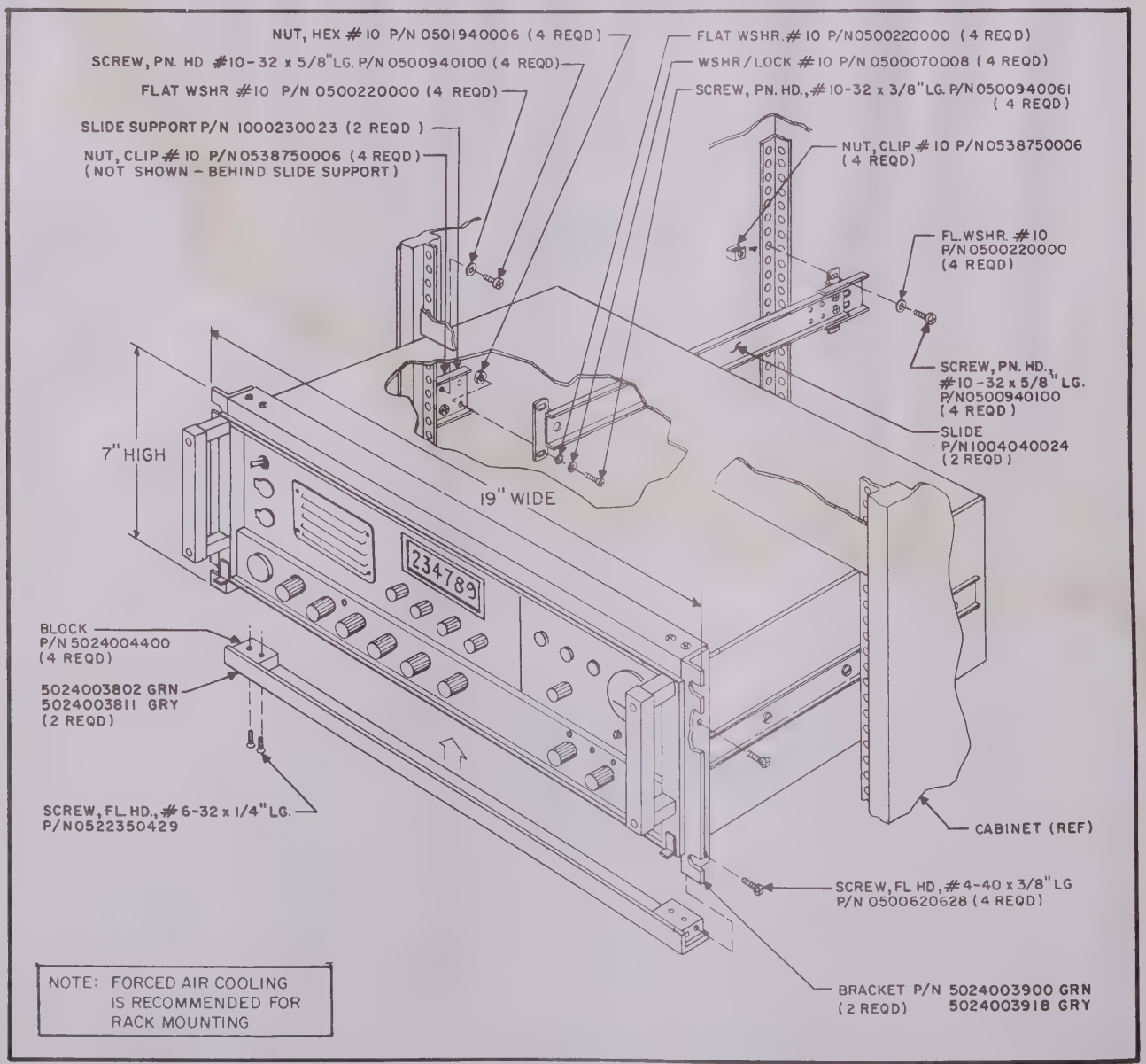

NUT, HEX #10 P/N 0501940006 (4 REQD)
SCREW, PN. HD. #10-32 x 5/8"LG. P/N 0500940100 (4 REQD)
FLAT WSHR #10 P/N 0500220000 (4 REQD)
SLIDE SUPPORT P/N 1000230023 (2 REQD)
NUT, CLIP #10 P/N 0538750006 (4 REQD) (NOT SHOWN - BEHIND SLIDE SUPPORT)
FLAT WSHR. #10 P/N 0500220000 (4 REQD)
WSHR/LOCK #10 P/N 0500070008 (4 REQD)
SCREW, PN. HD., #10-32 x 3/8"LG. P/N 0500940061 (4 REQD)
NUT, CLIP #10 P/N 0538750006 (4 REQD)
FL. WSHR. #10 P/N 0500220000 (4 REQD)
SCREW, PN. HD., #10-32 x 5/8" LG. P/N 0500940100 (4 REQD)
SLIDE P/N 1004040024 (2 REQD)
7" HIGH
19" WIDE
234789
BLOCK P/N 5024004400 (4 REQD)
5024003802 GRN 5024003811 GRY (2 REQD)
SCREW, FL HD., #6-32 x 1/4" LG. P/N 0522350429
CABINET (REF)
SCREW, FL HD, #4-40 x 3/8" LG P/N 0500620628 (4 REQD)
BRACKET P/N 5024003900 GRN (2 REQD) 5024003918 GRY
NOTE: FORCED AIR COOLING IS RECOMMENDED FOR RACK MOUNTING

Figure 2.6 Rack Mounted Installation

2.5 ANTENNAS AND GROUND SYSTEMS

2.5.1 GENERAL

The GSB-900SC is designed to operate into a 50 ohm resistive antenna system with a maximum voltage standing wave ratio (V.S.W.R.) of 2:1. When used with the GCU-910A, or GCU-935 Antenna Coupler, the system will match antennas ranging from 15 foot whips to 150 foot long wires. The couplers will also efficiently match 9 foot whip antennas at frequencies above 4 MHz.

As there are numerous types of antennas, a complete discussion is beyond the scope of the manual. Antennas for use in the 1.6 to 30 MHz spectrum generally fall into three categories:

(a) Narrow band 50 ohm antennas
(b) Random length non resonant antennas
(c) Broad Band 50 ohm antennas

Several popular antennas falling into each of the above categories are discussed below. For specific recommendations, consult our experienced Field Service Organization.

Some general "DO'S" and "DONT'S" of antenna installation are listed below:

a. Best performance will be obtained when the antenna is mounted as high as possible. The antenna should be clear of all large objects such as trees and buildings.

b. Although the GCU-910A or GCU-935 coupler will match electrically short antennas (i.e. those under 1/8 wavelength), such antennas are not efficient radiators. If the installation permits, antennas over 1/8 wavelength long at the lowest operating frequency should be used. Antenna length generally limits system performance in vehicular applications at frequencies below 10 MHz as the size would be prohibitive.

c. When using whip antennas, the ground system actually forms part of the radiating system. Where space permits (such as in a base station installation) a good ground plane or radial system should be installed at the base of the antenna. (See Figure 2.7)

NOTE

An inadequate ground system is most often responsible for disappointing performance when using a whip antenna.

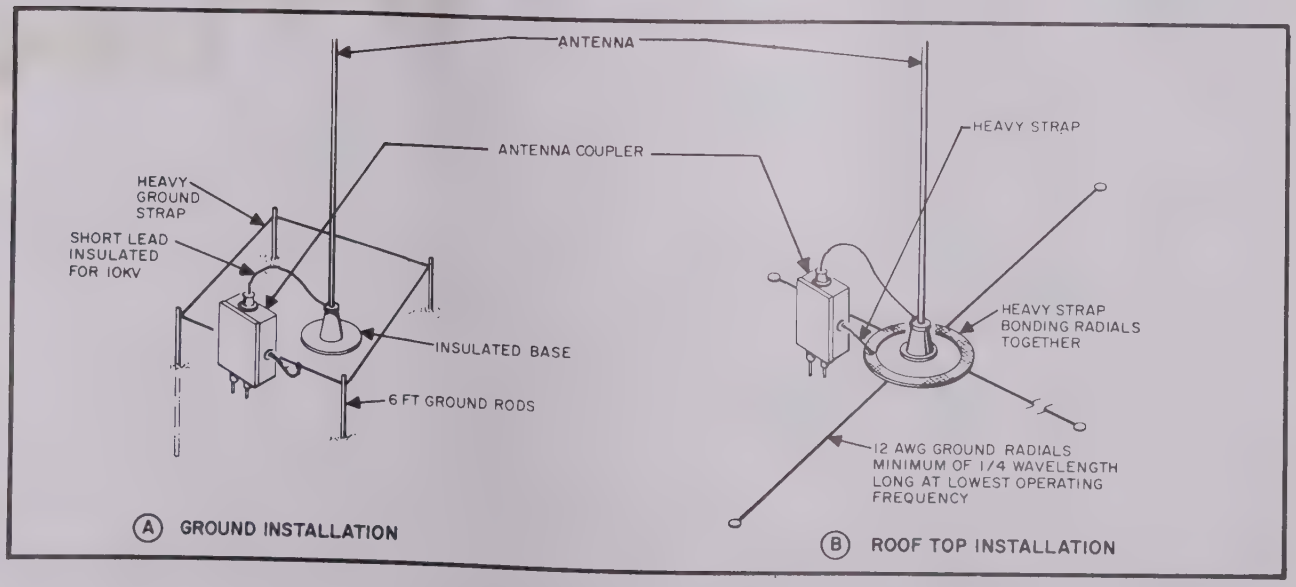

ANTENNA
ANTENNA COUPLER
HEAVY GROUND STRAP
SHORT LEAD INSULATED FOR 10KV
INSULATED BASE
6 FT GROUND RODS
A GROUND INSTALLATION
HEAVY STRAP
HEAVY STRAP BONDING RADIALS TOGETHER
12 AWG GROUND RADIALS MINIMUM OF 1/4 WAVELENGTH LONG AT LOWEST OPERATING FREQUENCY
B ROOF TOP INSTALLATION

Figure 2.7 Whip Antenna

d. In vehicular installations and marine installations in a metal hull ship, 1 inch wide strap or braid should be connected between the antenna coupler ground and the frame of the vehicle. The length should be as short as possible. In an installation aboard a wood or fiberglass boat, a ground plate with at least 12 square feet in contact with the water should be attached to the hull and a short, 1 inch wide strap should be connected between the coupler ground post and the plate. As previously mentioned this ground lead should be as short as possible.

2.5.2 NARROW BAND 50 OHM ANTENNAS

Typical of this type of antenna are the doublet and the inverted V illustrated in Figures 2.8 and 2.9 respectively. Both types of antennas may be assembled from the Sunair Doublet Antenna Kit (part # 99624). Their operation is efficient for only a narrow band of frequencies within approximately 2 1/2% of their center frequency. The antenna coupler is NOT generally required if the above frequency span is not exceeded. Separate antennas must be erected for each small band of frequencies to be used. Both antennas exhibit somewhat directional characteristics. The direction of maximum radiation is perpendicular to the antenna wire. The inverted V antenna is particularly suitable for communication with nearby mobile stations (with vertical antennas) since a portion of the radiation is in a vertical direction.

2.5.3 RANDOM LENGTH NON RESONANT ANTENNAS

Whips and long wires are popular non resonant antennas. The whip antenna (illustrated in Figure 2.7) is often used in mobile, marine, portable or semi portable installations because it is rugged and self supporting. The antenna impedance is strongly dependent on the operating frequency and an antenna coupler, therefore, must be used to match the antenna to the transceiver. Best radiation efficiency will be obtained if the antenna is at least 1/8 wavelength long at the lowest operating frequency; however, this requirement does not result in a practical size antenna for low frequency operation. Thirty-five foot whip antennas offer a good compromise between practical height and good electrical performance at low frequencies. The Antenna Couplers are designed to efficiently match whip antennas of 15 foot length or greater. An efficient match may also be obtained for a 9 foot whip above 4 MHz. The whip's performance is greatly influenced by its ground system. For temporary base station installations, a minimum of four six foot long ground rods should be driven into the ground symmetrically placed around the antenna base. The rods should be bonded together with heavy strap and then connected to the antenna coupler ground by another short heavy strap. If the antenna is mounted on the roof of a building, where a short ground lead to the coupler cannot be obtained, a minimum of 4 symmetrically placed

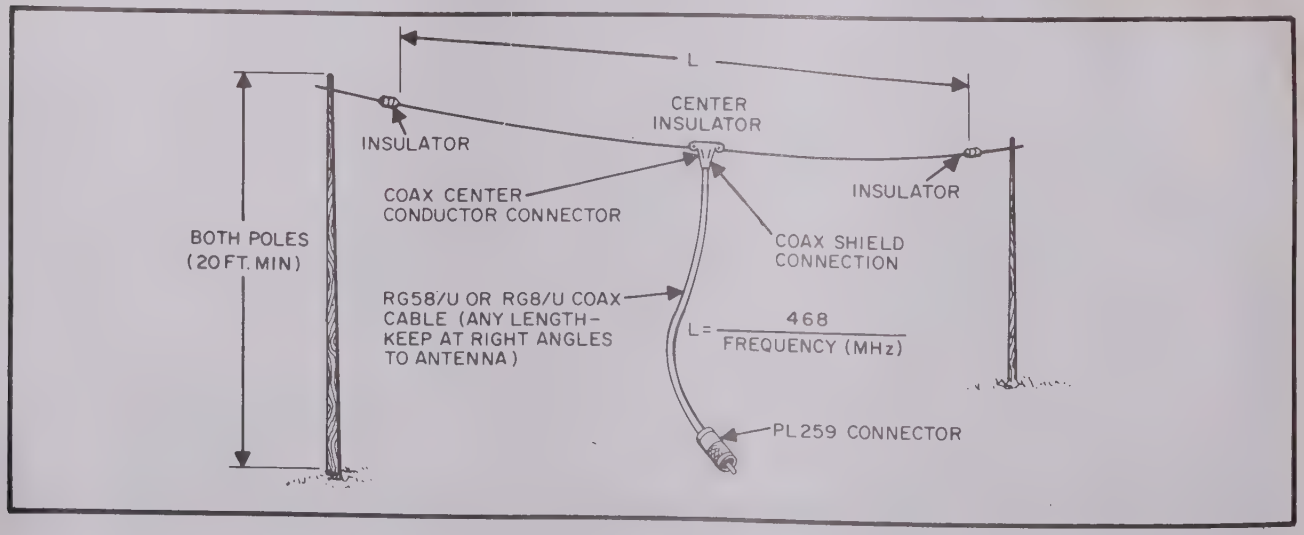


Figure 2.8 Doublet Antenna

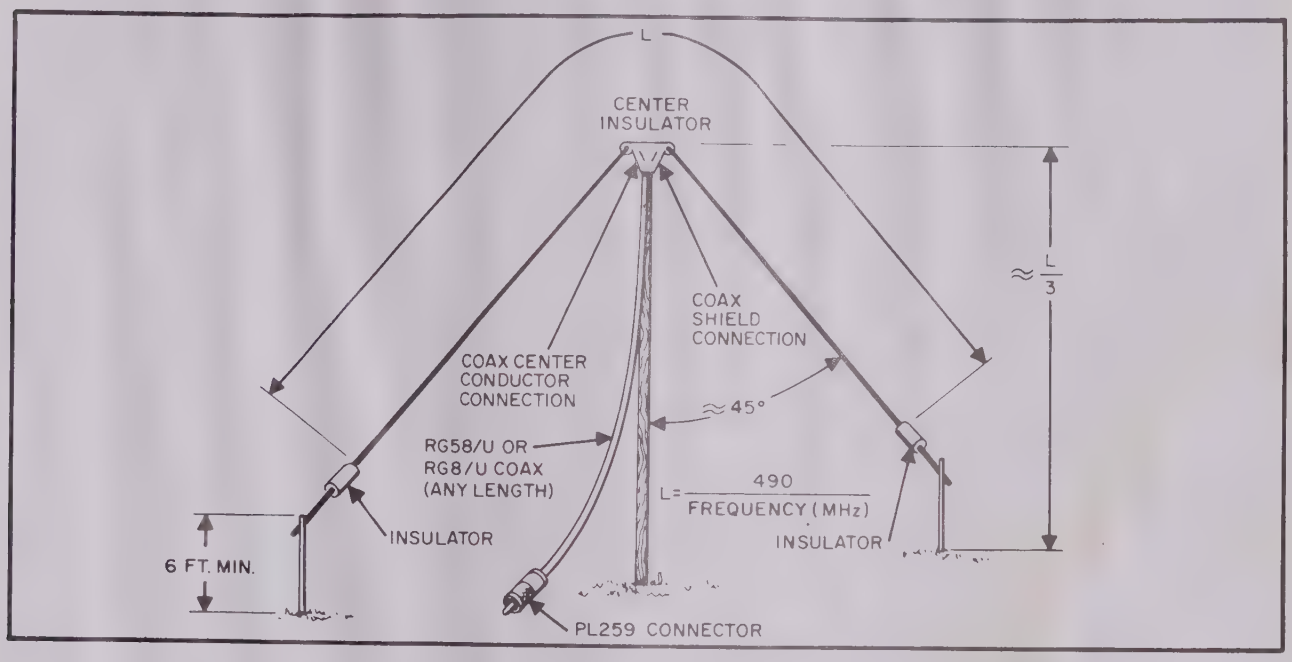


Figure 2.9 Inverted "V" Antenna

ground radials should be installed at the base of the antenna, bonded together, and connected to the antenna coupler ground post. The radials should be made of number 12 gauge wire or larger and should be at least 1/4 wave long at the lowest operating frequency. The whip's radiation pattern is omni-directional.

The long wire antenna, illustrated in Figure 2.10, is a popular base station antenna where a wide range of operating frequencies are used. The antenna impedance varies greatly with frequency and, therefore, must be matched to the transceiver with an antenna coupler. The antenna couplers will efficiently match long wire antennas up to 150 feet in length. The radiation pattern of the long wire antenna is also a function of operating frequency. The two most popular length long wire antennas, 75 and 150 foot (available from Sunair as part numbers 0999200003 and 0999210009 (respectively) exhibit excellent low frequency radiation efficiency.

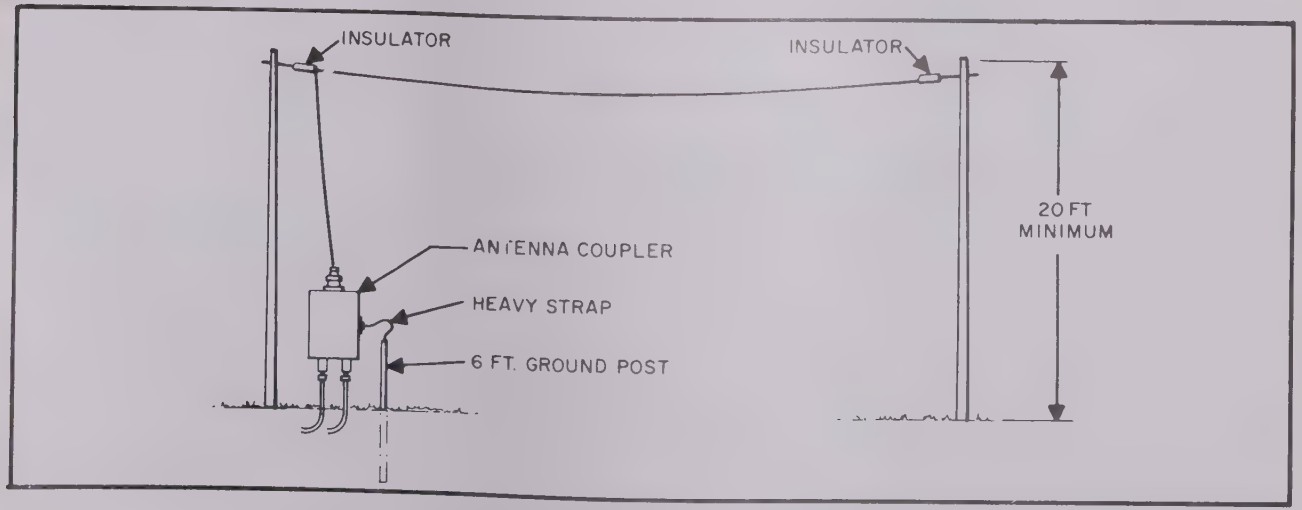


Figure 2.10 Long Wire Antenna

2.5.4 BROAD BAND 50 OHM ANTENNAS

These are generally complex, expensive antennas requiring a large area for installation. Their use is usually limited to high performance base station installations which must operate at diverse frequencies. As this class of antennas has approximately 50 ohm output impedance over the rated band of frequencies, an antenna coupler is NOT required. Some common examples are:

a) Discone (a vertical antenna with an omnidirectional pattern)

b) Log-Periodic (a horizontal antenna with highly directional pattern). This antenna is often made in a rotatable configuration.

Consult the Sunair Field Service department for specific recommendations.

2.6 POWER REQUIREMENTS

2.6.1 OPERATION FROM ALL A.C. POWER SOURCES

As supplied from the factory, the GSB-900SC is wired for continuous operation from 115 or 230 volt ±15%, 50-60 Hz, single phase A.C. power mains. The selection of 115 or 230 volt nominal line voltage is made by the appropriate wiring in the connector of the A.C. power cord assembly. The line voltage range may therefore be easily altered by changing the power cord, (See Table 2.11). The nominal line voltage is normally specified by the customer at the time of ordering and the proper A.C. power cord is shipped with the radio. Figure 2.12 shows the line cord assembly wiring for 115 volt operation while Figure 2.13 shows the 230 volt wiring.

CAUTION

Check the tag on the line cord before connecting the radio to power mains to insure that the correct voltage has been selected. Permanent damage to the radio may occur if the incorrect power cord is used. Refer to Table 2.14 and check fuses F1 and F2 on the rear apron to make sure the proper value has been inserted in the fuse holders.

2.6.2 A.C. OPERATION UNDER HIGH LINE VOLTAGE CONDITIONS

The GSB-900SC power supply a-c transformer has provision for high line connection. If the a-c power mains are normally high (132 or 264 vac) the high line connection should be used as the radio will dissipate less power and operation will be more reliable.

The radio may be wired for high line voltage operation by changing connections on terminal strip 1A6TB1 on the power supply (refer to Figures 2.15 and 2.16). The GBS-900SC is normally wired at the factory for the nominal 115/230 volt connections.

NOMINAL LINE VOLTAGE	LINE VOLTAGE RANGE	POWER CORD IN USE	REFER TO FIGURES
115	98 to 132	115V	2.12, 2.15
*132	112 to 152	115V	2.12, 2.16
230	196 to 264	230V	2.13, 2.15
*264	224 to 304	230V	2.13, 2.16

* High Line Connections

Figure 2.11 A.C. Line Voltage Range Table

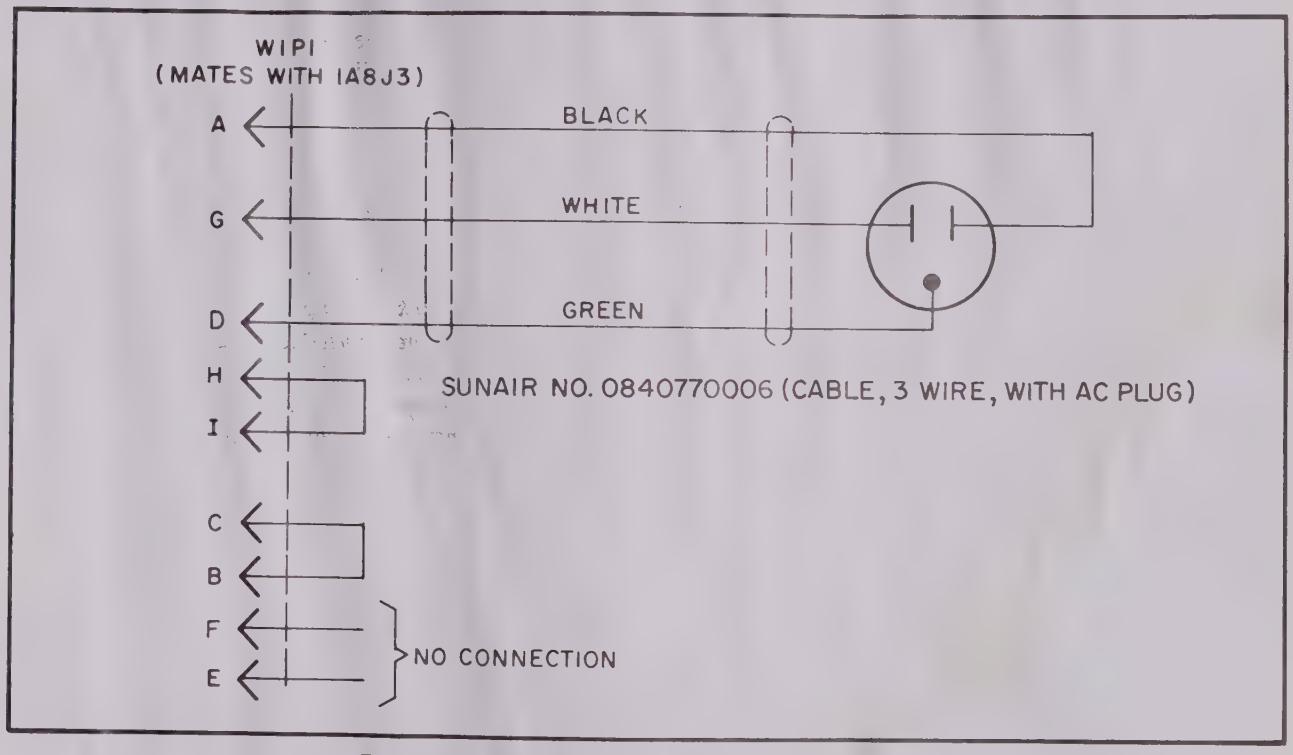


Figure 2.12 115 VAC Power Cord Schematic

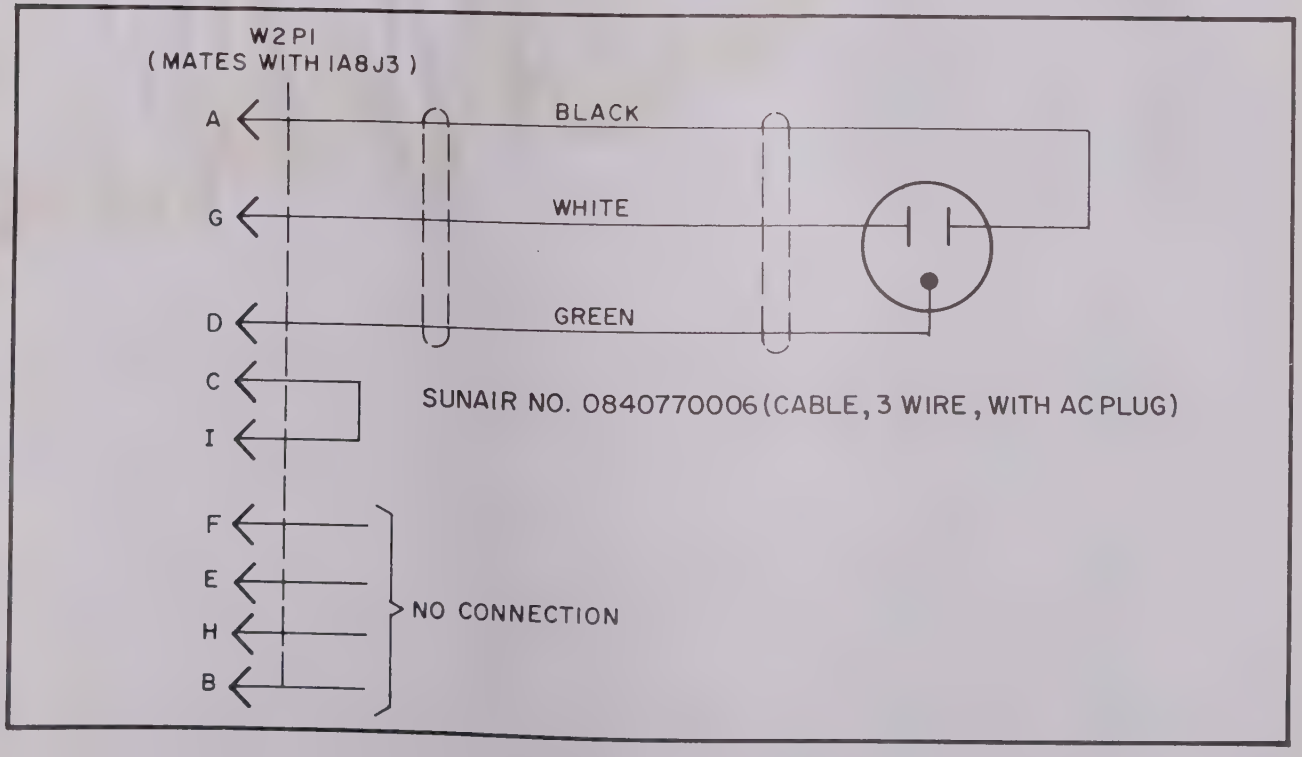


Figure 2.13 230 VAC Power Cord Schematic

NOTE

The high line voltage connections must either be requested at the time of ordering or the radio must be rewired in the field to provide for continuous high line voltage operation (see figure 2.16).

2.6.3 OPERATION FROM D.C. POWER SOURCE

If the GSB-900SC is equipped with the optional D.C. Inverter Module (Sunair part no. 5024-0213) operation from D.C. power sources of 13 or 26 volts ±10%, positive or negative groundk is possible. The GSB-900SC is unique in that both D.C. and A.C. power supplies can be left in the radio at all times. Selection of D.C. or A.C. operation is accomplished by wiring in the connector of the Power Cord Assembly. The selection of operation from nominal 13 or 26 volt power sources is accomplished by changing connections on terminal strip 1A6TB2 (see figure 2.17) on the power supply and on the D.C. Inverter assembly 1A6A2. The Power Cord wiring for D.C. operation is shown in figure 2.18.

CAUTION

Before connecting the radio to the D.C. power source, check the marker tag on the regulator heat sink at the rear of the radio to make sure that the proper voltage range has been selected. Permanent damage to the radio can occur if the wrong range is selected.

The GSB-900SC incorporates reverse polarity protection when fed from D.C. power sources. If the radio does not operate, check the polarity of the D.C. power connections. Refer to the accessory section of the manual for detailed installation instructions of the D.C. Inverter Module. The D.C. Power

DESIGNATOR	FUNCTION	LOCATION	TYPE AND RATING
1A8F1, 1A8F2	A.C. Line	Rear Apron	For nominal 115V input, use type MDL (SLO-BLO), 5 amp. For nominal 230V input, use type MDL (SLO-BLO), 3 amp.
1A8F3	D.C. Line	Rear Apron	For nominal 13V input, use type MDL(SLO BLO), 30 amp. For nominal 26V input, use type MDL(SLO BLO), 15 amp.
1A6F1	+28V	Power Supply	Type AGC, 15 amp.
1A6F2	+12V	Power Supply	Type AGC, 3 amp.
1A6F3	+5V	Power Supply	Type AGC, 3 amp.

Figure 2.14 GSB-900SC Fuse Table

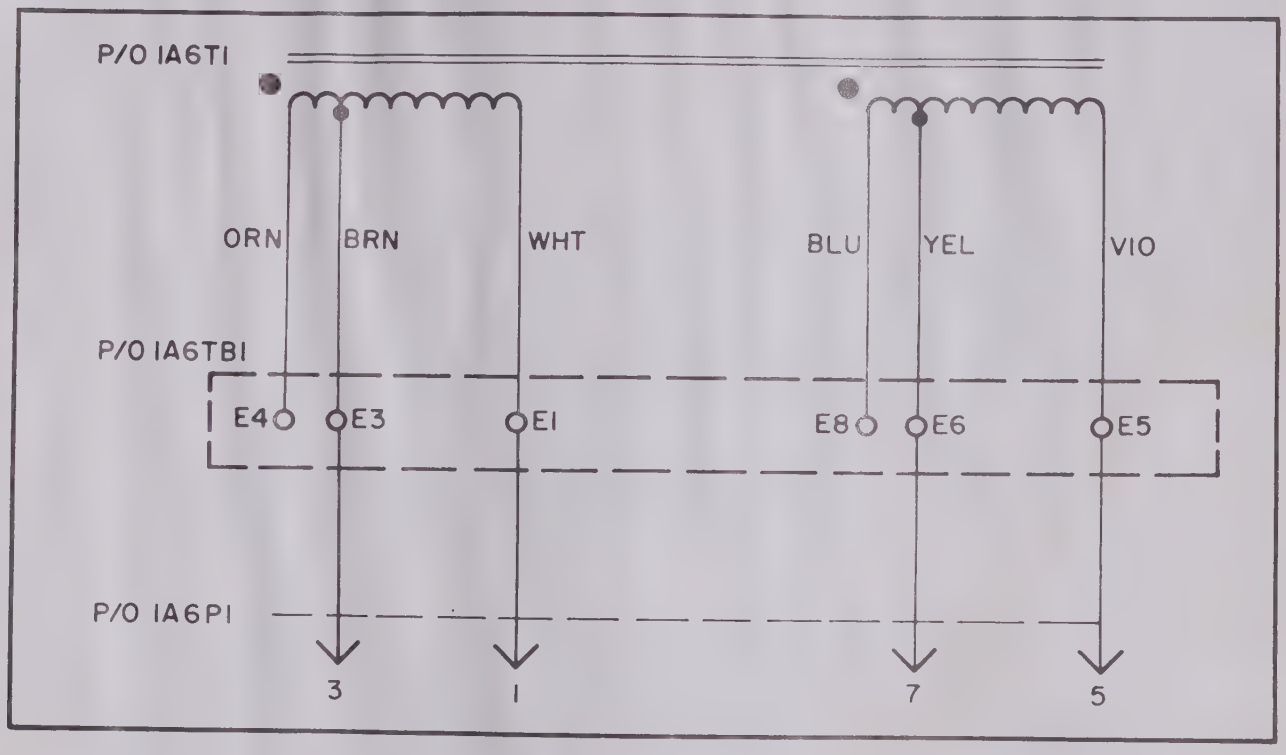


Figure 2.15 Power Supply Wiring – 115V or 230 VAC Inputs

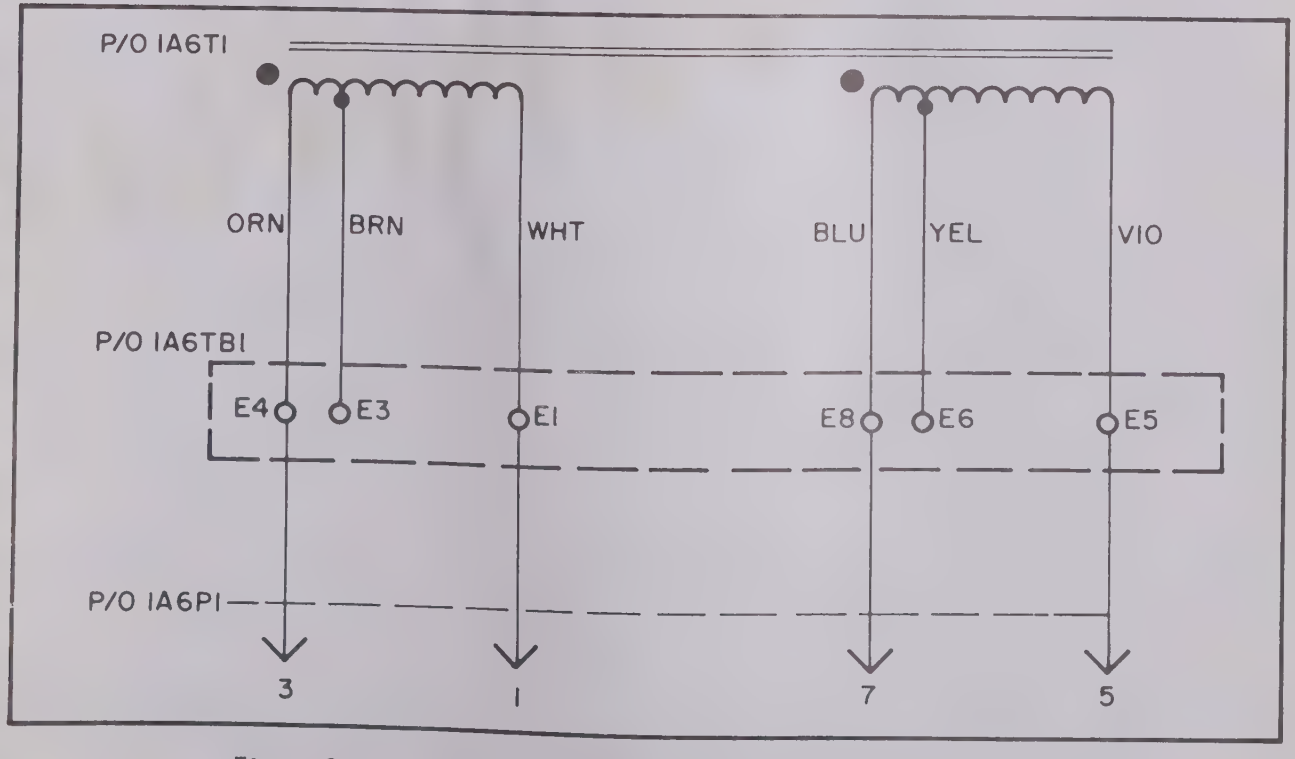
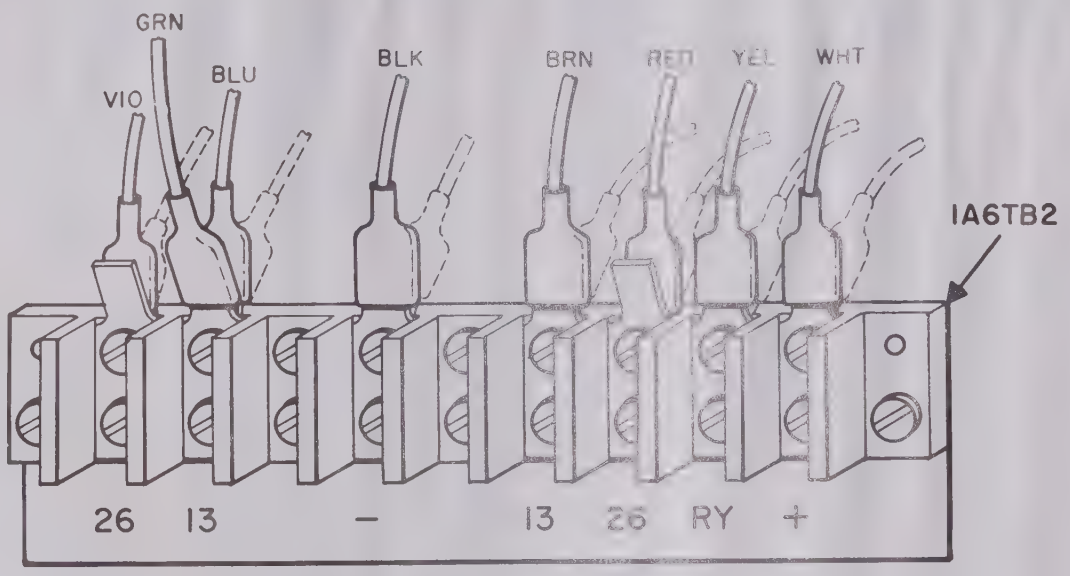
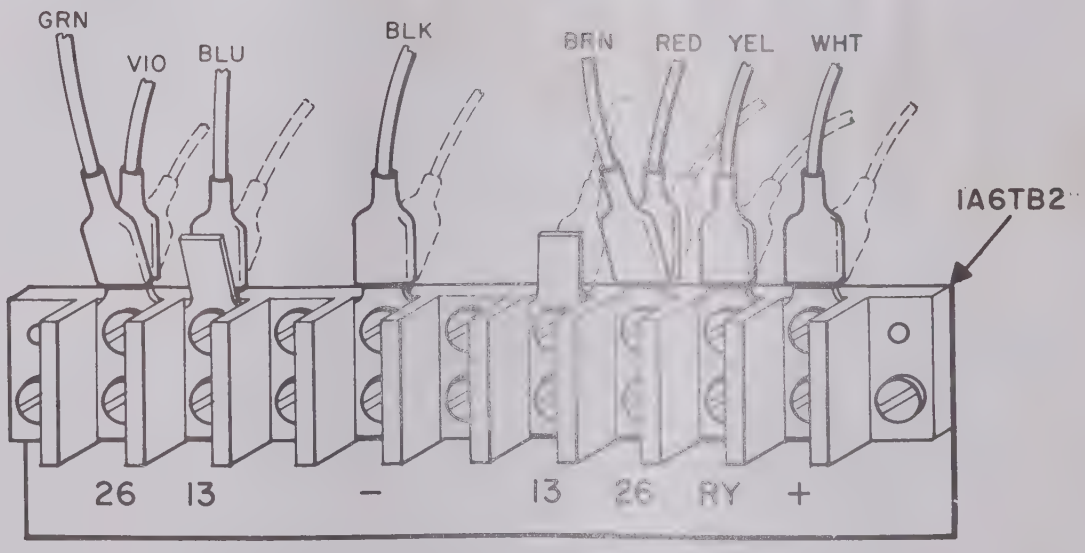


Figure 2.16 Power Supply Wiring – 132 V or 264 VAC Inputs



CONNECTIONS SHOWN ABOVE FOR 13 VDC OPERATION
NOTE: JUMPER MUST BE CONNECTED BETWEEN
E10 AND E11 ON D.C. INVERTER BOARD



CONNECTIONS SHOWN ABOVE FOR 26 VDC OPERATION
NOTE: JUMPER MUST BE CONNECTED BETWEEN
E9 AND E10 ON D.C. INVERTER BOARD

Figure 2.17 D.C. Inverter Connections to Power Supply Terminal Strip 1A6TB2

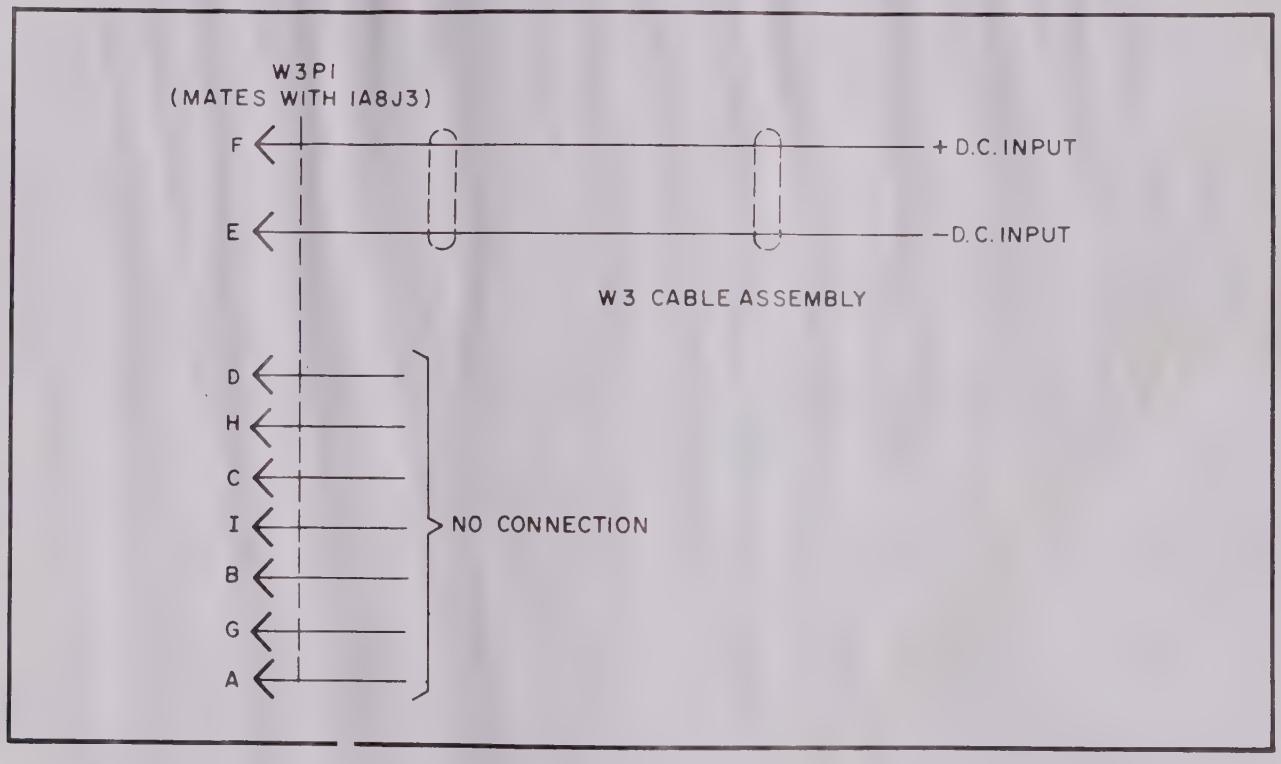


Figure 2.18 D.C. Power Connector Schematic

Cable Assembly is supplied from the factory with approximately 10 feet of connecting cable. However, if the installation permits, the cable should be then trimmed to minimum length consistent with a neat installation. This will ensure minimum voltage drop in the cable under the high input currents present when in transmit (particularly with 13 volt input).

NOTE

Before applying power to the radio, refer to table 2.14 and check that the correct value of fuse F3 (on the rear apron of the radio) has been inserted in its fuse holder.

2.7 GRC-951 AUDIO REMOTE CONTROL UNIT

The GRC-951 Audio Remote Control unit provides for remote control of GSB-900SC audio and keyline functions at separations of up to 200 feet from the transceiver. The GRC-951 outline drawing is shown in figure 2.20. A universal swivel-type mounting bracket is supplied with the unit, permitting installation in a variety of locations. To install the GRC-951, procede as follows:

a) Select the mounting location and mount universal mounting bracket.

b) Route control cable (0588690007) through any conduits, walls, etc. Trim off any excess cable.

c) Refer to figure 2.19 and wire connectors P1 and P2. Note that the cable shield is grounded to Pin A only at the end connected to the transceiver.

d) Secure GRC-951 to the universal mounting bracket.

e) Connect P2 to the GRC-951 remote control and P1 to the GSB-900SC. Connect Power cord and antenna to the GSB-900SC.

NOTE

The internal adjustments in the GSB-900SC have been set at the fac-

tory to supply proper audio levels to the GRC-951, in case of insufficient audio levels, perform the following adjustments.

f) Remove the top cover and receiver/exciter module top cover from the GSB-900SC.

g) Set the VOLUME control of the remote control to the middle of its range. Connect a microphone to the remote control.

h) Turn REMOTE AUDIO LEVEL control 1A3A4R48 on the AUDIO board in the GSB-900SC at least 10 turns counterclockwise.

i) Turn REMOTE TRANSMIT AUDIO LEVEL control 1A3A4R58 on the AUDIO board in the GSB-900SC at least 10 turns counterclockwise.

j) Apply power to the GSB-900SC. Tune in a moderately strong signal on the GSB-900SC (using local speaker). Advance 1A3A4R48 clockwise until a comfortable listening level is achieved in the GRC-951 speaker.

k) Select the highest transmit frequency anticipated (normally 29.9999 MHz), refer to section 3 and check out transmit operation using local controls.

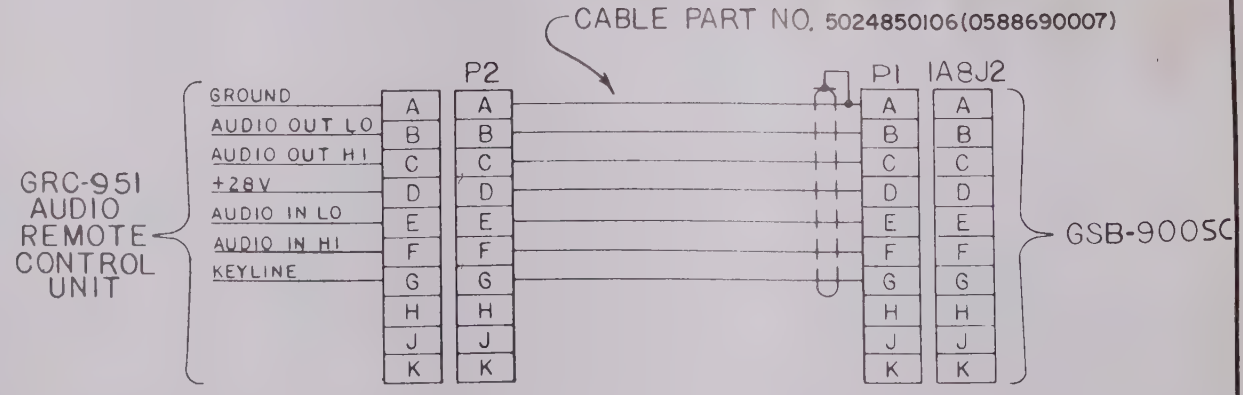
l) Depress the push-to-talk (PTT) button on the microphone connected to the remote control. Speaking in a normal voice, carefully advance 1A3A4R58 on the AUDIO board clockwise until no further increase in power output on the meter of the GSB-900SC is noted (this is the threshold of ALC). Advance 1A3A4R58 two turns beyond this point.

m) Replace the receiver/exciter module top cover and the GSB-900SC top cover.

THE UNIT IS NOW READY FOR OPERATION

In the event of improper operation, refer to section 4.10.

DESIGNATOR	TYPE	SUNAIR PART NO.
P1	MS3106A(18-19 P)	0754000001
P2	MS3106A(18-19 P)	0754000001



INTERCONNECT DIAGRAM

Figure 2.19 GRC-951 Audio Remote Control Unit Interconnect Diagram

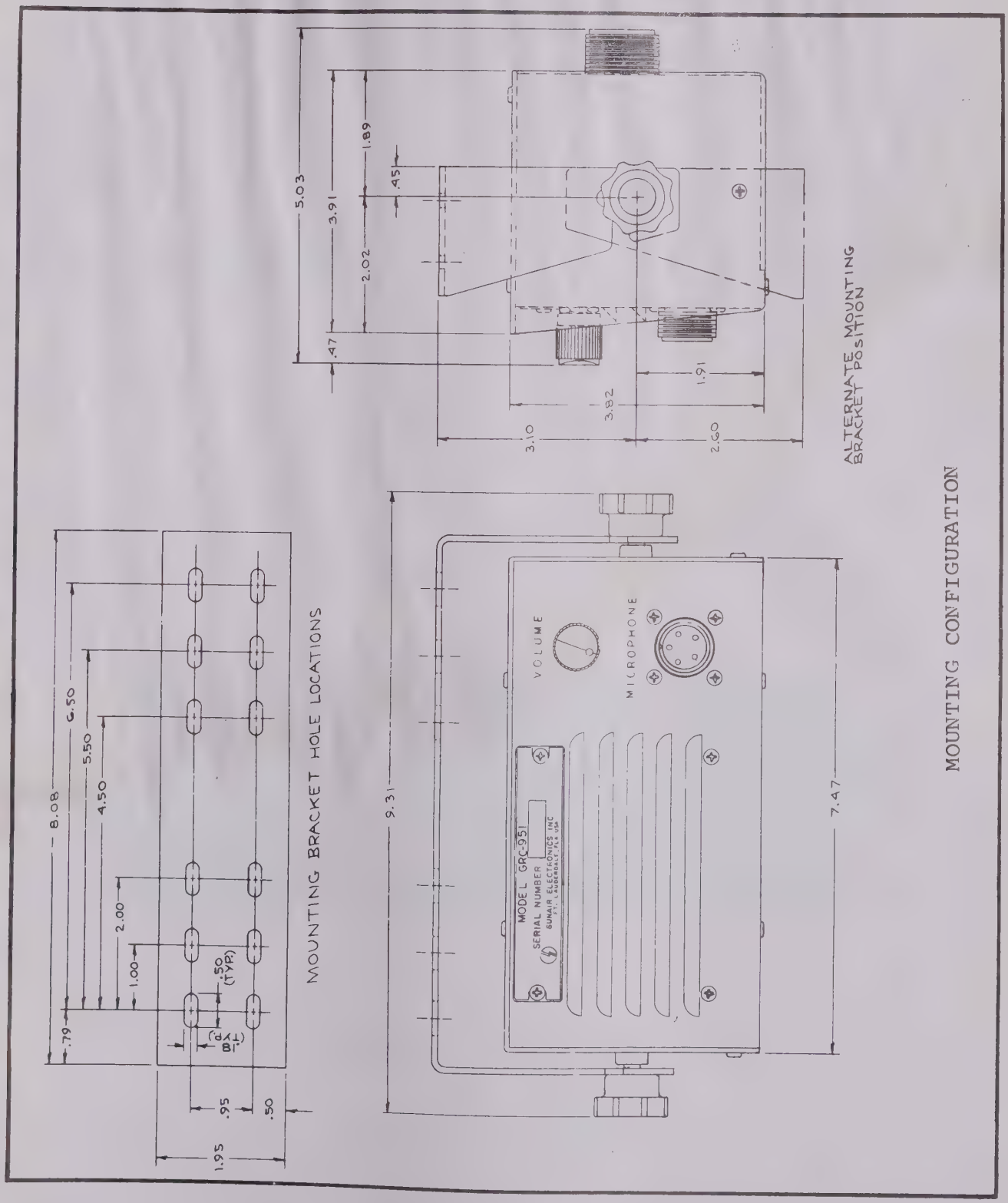


Figure 2.20 GRC-951 Audio Remote Control Unit Outline Configuration

Table 2.1
MATING CONNECTORS TO GSB-900SC AND ACCESSORIES

DESCRIPTION		DESIGNATOR	MATING PARTS		
			Connector	Cable Clamp	Rubber Boot(s)
			Sunair Part Numbers		
GSB-900SC	Microphone	1A1J1	0753570009	0754450007	0700550038
	Phone	1A1J2	0754010007	–	–
	Key	1A1J3	0754010007	–	–
	Antenna	1A8J1	0742190005 (Note 1)	–	–
	Audio	1A8J2	0754000001	0740250001	0700550046
	Power	1A8J3	0753580004	0754570002	0700550038 0700550046 0700550054
	Accessory	1A8J4	0754690008	Included with Connector	0700550054 0700550062 0700550071
GCU-910 or GCU-935	RF Input	J1	0747020001 (Note 2)	–	–
	Control Unit	J2	0747640009	Included with Connector	0700550054 0700550062 0700550071
GRC-951	Audio	J1	0754000001	0740250001	0700550046

NOTE

1. ***When used with RG-58/U Coax, use Adapter No. 0742070000.***
2. ***When used with RG-8/U Coax, use connector No. 0754140008.***

SECTION 3
OPERATION

3.1 GENERAL

This section provides installation and instructions required for proper operation of the Secure Channel front panel.

3.2 OPERATING CONTROLS

3.2.1 Listed in the next pages are descriptions of all controls, indicators and connectors located on the Secure Channel front panel. They are illustrated in Figure 3.1.

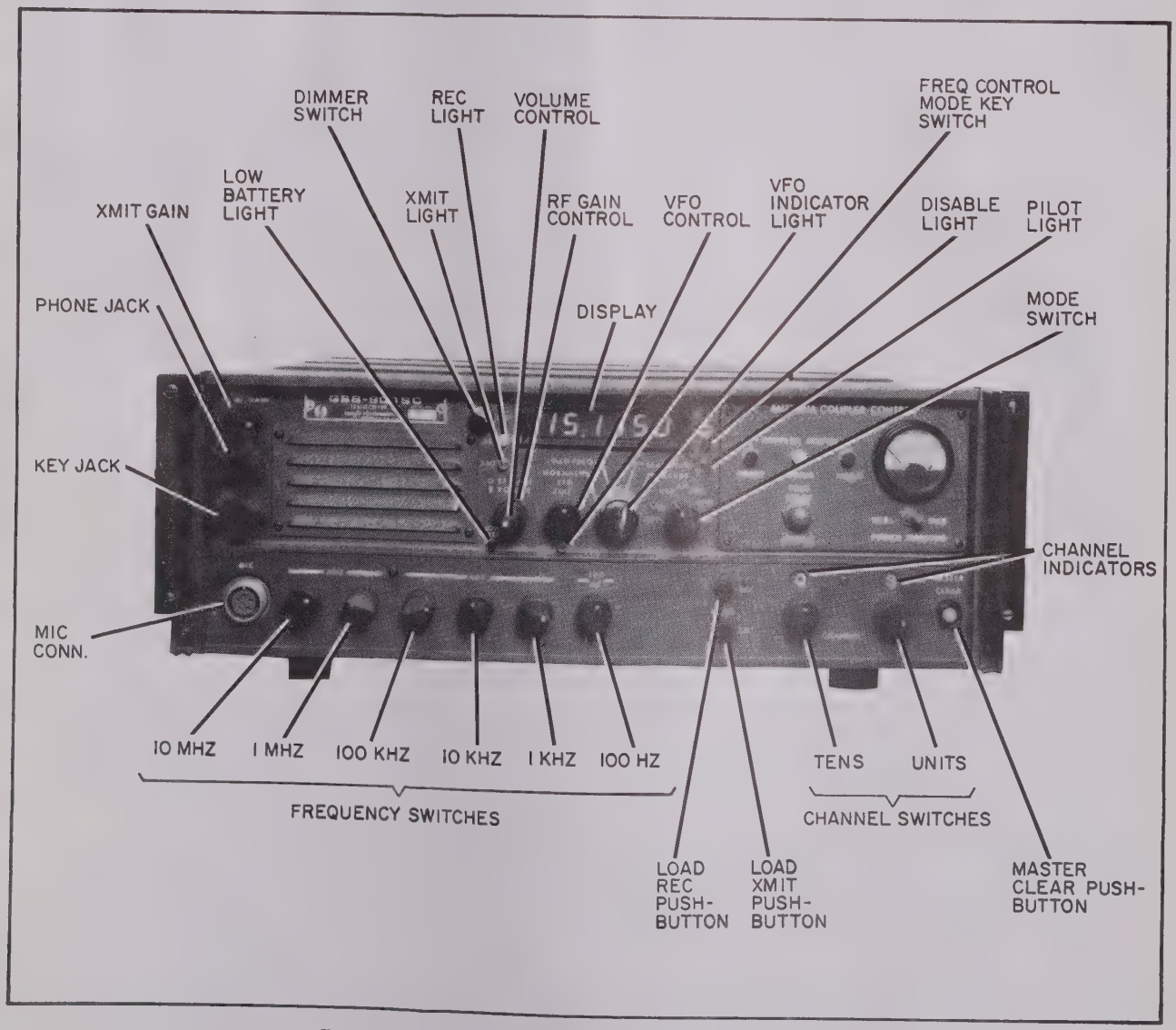


Figure 3.1 GSB-900SC Transceiver Front Panel

	SWITCH POSITION	EQUIPMENT RESPONSE
MODE SWITCH	OFF	Disconnects Primary Power
	LSB	a) Applies Primary Power b) Select Lower Sideband Mode
	USB	a) Applies Primary Power b) Selects Upper Sideband Mode
	AM	a) Applies Primary Power b) Selects Amplitude Modulation Mode
	CW	a) Applies Primary Power b) Selects Continuous Wave Mode.A CW key must be connected to the key jack on the front panel.
	CPLR TUNE KW	a) Applies Primary Power b) Disconnects microphone and CW key. c) Keys the radio in AM mode. IF AN ACCESSORY GCU-910, GCU-935, OR GSL-1900 IS CONNECTED IN THE SYSTEM: d) Energizes the accessory.
VOLUME (outer knob)		Controls the level of the receive audio signal to the speaker and PHONE jack.
RF GAIN (inner knob)		Controls gain of the RF and IF amplifiers in the receive mode. Counter clockwise rotation decreases the gain.
FREQ CONTROL MODE SWITCH	NORMAL	a) Six frequency switches select simplex operating frequency. b) Display contains frequency switch setings. c) The following controls are disabled: Load Xmt Pushbutton, Load Rec Pushbutton, Channel Selector Switches, Master Clear Pushbutton. d) Rec Light is on when radio receives. e) Xmt Light is on when radio transmits.
	LOAD FREQ	a) Six frequency switches select programming frequencies to be loaded into the memory system. b) Display contains frequency switch settings. c) Channel Selector Switches select memory locations to be loaded with desired transmit and receive frequencies. d) Load Rec Pushbutton, when depressed, loads selected receive frequency into receive frequency memory location of selected channel.

	SWITCH POSITION	EQUIPMENT RESPONSE
FREQ CONTROL MODE SWITCH	LOAD FREQ (Cont.)	e) Load Xmt Pushbutton, when depressed, loads selected transmit frequency into transmit frequency memory location of selected channel. f) Rec Light is on unless Load Xmt Pushbutton is depressed. When Load Xmt is depressed, Xmt Light turns on. g) Radio is disabled in this mode. Disable Light is on.
	READ FREQ	a) Channel Selector Switches select memory locations in which operating frequencies are stored. b) Display contains operating frequencies stored in memory location of selected channel. c) The following controls are disabled: Six Frequency Switches, Load Rec Pushbutton, Master Clear Pushbutton. d) Load Xmt Pushbutton causes transmit frequency, which is stored in transmit frequency location of selected channel to be displayed. Radio does not transmit since this operation is designed only to verify the stored transmit frequency. e) Xmt Light is on any time the radio is transmitting as a result of keying the Microphone or pressing the CW Key. Display will contain the transmit frequency. Xmt Light also is on when Load Xmt Pushbutton is pressed even though radio only displays transmit frequency and does not actually transmit. f) Rec Light is on at all times when the Xmt Light is not on.
	SECURE	a) All responses same as in Read Freq Mode except that display is blank preventing any front panel indication of operating frequencies.
FREQUENCY SWITCHES (6)		10 MHz switch, 1 MHz switch, 100 kHz switch, 10 kHz switch, 1 kHz switch, 100 Hz switch.

	EQUIPMENT RESPONSE
FREQUENCY SWITCHES (6) (Cont.)	a) Selects the simplex operating frequency in the Normal Frequency Control Mode. b) Selects the programming frequencies to be loaded into the memory in the Load Freq Mode. c) Disabled in the Read Freq and in the Secure mode.
CHANNEL SELECTOR SWITCHES (2)	Channel Tens switch, Channel Units switch. a) Disabled in the Normal mode. b) Selects the memory locations to be loaded with desired transmit and receive frequencies in Load Freq mode. c) Selects for frequency control the memory locations containing the required transmit and receive frequencies in both Read Freq and Secure mode.
LOAD REC PUSHBUTTON	a) Disabled in Normal, Read Freq and Secure mode. b) Loads selected receive frequency into receive frequency memory location of selected channel in Load Freq mode.
LOAD XMT PUSHBUTTON	a) Disabled in Normal and Secure Mode. b) Loads selected transmit frequency into transmit frequency memory location of selected channel in Load Freq mode. c) Causes transmit frequency to be displayed without causing radio to transmit in Read Freq mode for the purpose of verifying stored transmit frequency.
MASTER CLEAR PUSHBUTTON	a) Disabled In Normal, Read Freq and Secure mode. b) Instantaneously erases all frequencies in Load Freq mode.
REC LIGHT	a) Lights when radio is receiving in Normal and in Secure mode. b) Lights when Load Xmt Pushbutton is not being pressed in Load Freq mode. c) Lights when receive frequency is displayed and radio is receiving or when Load Xmt Pushbutton is not being pressed in Read Freq mode.

	EQUIPMENT RESPONSE
XMT LIGHT	a) Lights when radio is transmitting in Normal and in Secure mode. b) Lights when transmit frequency is being stored by pressing Load Xmt Pushbutton in Load Freq mode. c) Lights when radio is transmitting in Read Freq mode as a result of the Microphone being keyed or the CW key being pressed. d) Lights when Load Xmt Pushbutton is pressed in Read Freq mode to verify a stored transmit frequency.
LOW BTRY LIGHT	Lights when radio turns on if batteries that retain the contents of the memory system when the radio is off are low enough to require replacement with fresh batteries.
XMIT GAIN	Controls microphone input level to the transceiver In TRANSMIT mode.
KEY JACK	Accepts standard 1/4 inch 2 circuit plug (such as PJ-055B) from CW telegraph key.
PHONE JACK	Accepts standard 1/4 inch 2 circuit plug from earphones. Automatically disconnects speaker, when in use.
DIM CONTROL	Provides two level intensity control of LED frequency readout, pilot light, Rec Light and Xmt Light. Provides off-on control of Channel Indicators and meter illumination.
MIC CONNECTOR	For connection of dynamic microphone with built in push-to-talk (PTT) switch. Mates with standard MS connector MS3106A (14S-05P).
VFO (potentiometer control with pull-on, push-off switch)	a) VFO OFF mode (control pushed in): Frequency controlled solely by the FREQUENCY dials. b) VFO ON mode (control pulled out) ±5 kHz range is provided. "VFO ON" indicator light is lit in this mode.
VFO INDICATOR LIGHT	Lights when in VFO mode.
FREQUENCY DISPLAY	a) Indicates simplex frequency selected by six Frequency Switches in Normal Frequency Control Mode.

	EQUIPMENT RESPONSE
FREQUENCY DISPLAY (Cont.)	b) Indicates transmit or receive frequency selected by six Frequency Switches for storage into desired memory location in Load Freq mode. c) Indicates stored receive frequency when the radio is receiving and stored transmit frequency when the radio is transmitting in Read Freq mode. d) Indicates stored transmit frequency in Read Freq mode when Load Xmt Pushbutton is pressed. The radio is not actually transmitting in this case, since the transmit frequency is only displayed for verification. e) Blanked in Secure mode. f) Flashes any frequency under 1.6000 MHz off and on at a rate of once a second.
PILOT LIGHT	Illuminates front panel controls.
DISABLE LIGHT	Lights when a frequency below 1.6000 MHz has been selected. Lights when Load Freq position of Frequency Control Mode switch is selected. The radio is disabled when this light is illuminated.

3.3 REAR APRON FUSES AND CONNECTORS

3.3.1 Refer to Figure 3.2 for location

ANT (1A8J1).....	ANTENNA connector: R.F. input/output of unit. Mates with standard PL-259 RF connector.
AUDIO (1A8J2)	AUDIO connector: for connection of 600 ohm balanced AUDIO OUTPUT and AUDIO INPUT. Mates with standard MS connector MS3106A (18-19P).
POWER (1A8J3).....	POWER connector: for connection of A.C. or D.C. power to the Transceiver (see Section 2.6). Mates with standard MS connector MS3106A (24-11S)
ACCESSORY ..... (1A8J4)	ACCESSORY connector: For connecting accessory equipment such as the GCU-910 Antenna Coupler. Mates with standard MS connector MS3106A (28-21P).

FUSES (F1, F2, F3) ..... A.C. and D.C. input line fuses (see Fig. 2.14).

GROUND POST ..... Refer to Section 2, paragraph 2.4.1 (b).

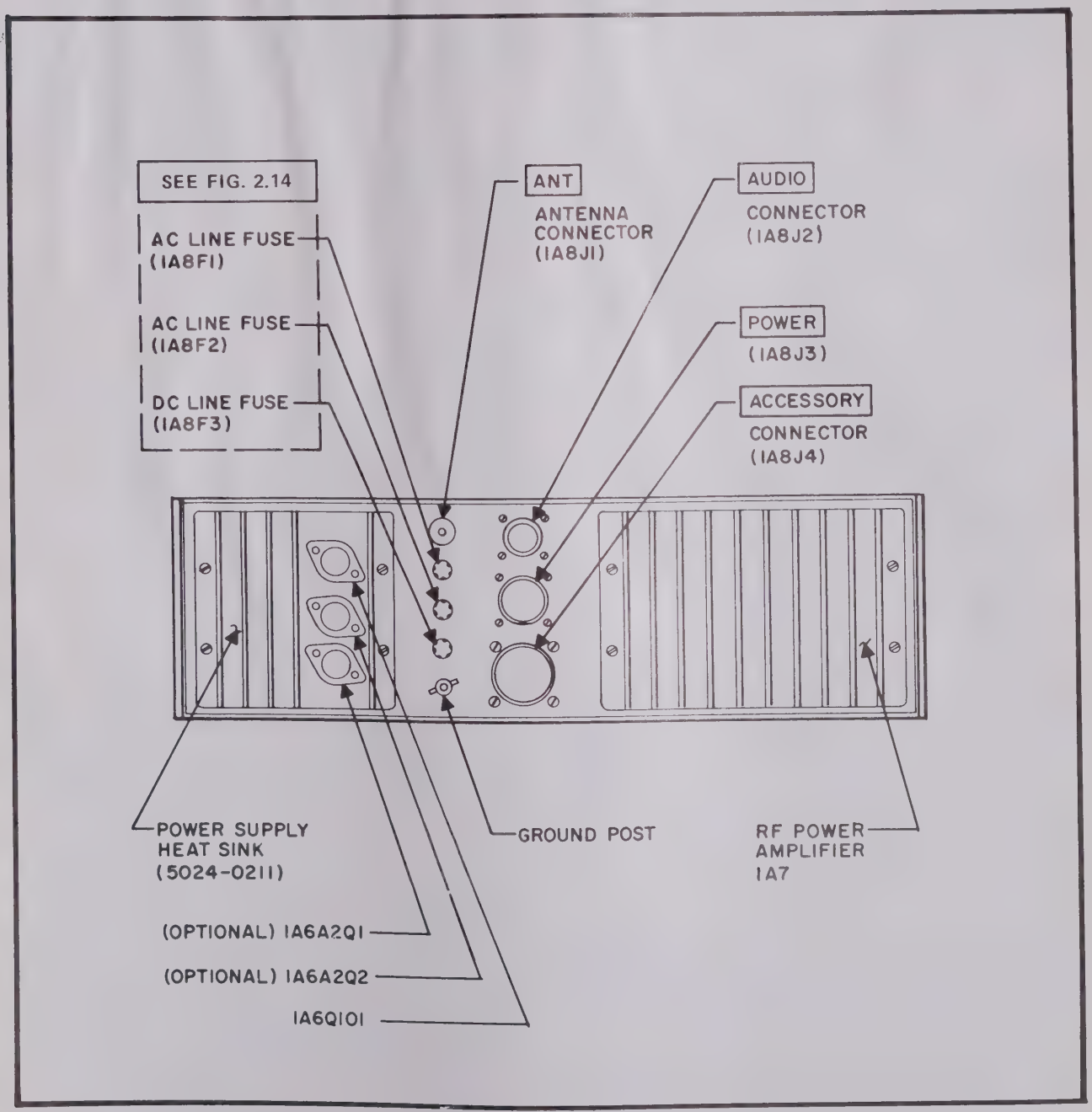


Figure 3.2 GSB-900SC Rear Aprons Components and Connectors

3.4 OPERATING THE GSB-900 SC INTO A 50 OHM ANTENNA

Connect the 50 ohm antenna (or dummy load) to the transceiver. Connect a microphone (to 1A1J1), a CW key (to 1A1J3) or 600 ohm audio source (to 1A8J2).

Follow the steps listed below:

a) Turn the VOLUME and XMIT GAIN controls fully counter-clockwise. Turn the RF GAIN control fully clockwise.

b) Set the MODE switch for the desired operating mode (LSB, USB, AM, or CW).

c) Turn DIM control fully CW. This is the bright or daytime position. (One stop CCW is the dim or night time position. Fully CCW is off.)

d) Turn the FREQ CONTROL MODE switch to Normal position.

e) Set the six FREQUENCY dials to the desired operating frequency. Set the VFO control in the "in" (off) position.

f) Set the VOLUME control for a comfortable listening level.

g) RF GAIN control: For normal operating conditions, the RF GAIN control may be left set in its maximum clockwise position as this will provide the greatest receiver sensitivity. When receiving a strong signal, background noise may be considerably reduced by setting the RF GAIN control to provide an "S" meter reading (with no-signal) equal to the "signal present" condition.

h) If being used in LSB or USB modes: key microphone. Speak into the microphone and advance the XMIT GAIN control until no further output (as indicated on the front panel meter) can be obtained. Do not advance the control beyond this point as no further power output will occur and increased background noise will be picked up by the microphone.

If being used in the AM mode: key microphone. Note carrier level (approximately 30 to 40 watts when not talking) on meter. When talking, advance the XMIT GAIN control until the meter "bounces" slightly with voice peaks.

If being used in the CW mode: The level of sidetone to the transmit section is preset at the factory. No adjustment of the XMIT GAIN control is necessary. Automatic switching of the transceiver from receive to transmit will occur when the key is depressed. In addition, a side tone (approximately 1 kHz) should be audible from the speaker whenever the key is depressed.

NOTE

When communicating in CW with a station keying its carrier, rather than a 1 kHz sidetone as in the GSB-900SC, it may be necessary to decrease the GSB-900SC frequency by 1 kHz. When communicating between GSB-900SC's or similar synthesized equipment, no correction is necessary.

If being used with a remote audio input: Potentiometer R58 on the AUDIO board (1A3A4) should be used to adjust the transmit audio level (if required) instead of the XMIT GAIN control on the front panel.

j) VFO operation: When receiving a signal from a transmitter with synthesized frequency control, it is seldom necessary (or desirable) to use the VFO receiver tuning control, and it should be left in its "in" position. When receiving signals from non-synthesized transmitting equipment, some error in transmitted frequency may exist. Pull out the VFO control (note light comes on) and adjust for the most natural quality. Approximately ±5kHz range is provided around the set frequency.

k) Loading Frequencies, Simplex Operation: Turn the Freq Control Mode Key switch to the Load Freq position. The Disable Light will turn on indicating that the radio is disabled. The Rec Light will be on. Set the two Channel Selector switches to the desired storage channel. Set the six Frequency Selector switches to the desired receive and transmit frequency. Press and release the Load Rec Pushbutton. Next press and release the Load Xmt Pushbutton. The Xmt Light should turn on and the Rec Light should turn off while the Load Xmt Pushbutton is pressed. The channel now contains the desired frequency in both its receive memory location and its transmit memory location. To verify that the channel is loaded with the correct frequency, turn the Freq Control Mode switch to the Read Freq position. The Disable Light should turn off and the display should contain the frequency loaded above. Press and hold the Load Xmt Pushbutton. The Xmt Light should turn on and the Rec Light should turn off. The display should continue to display the frequency loaded above. Release the Load Xmt Pushbutton. The Rec Light should turn on and the Xmt Light should turn off. Leave the Frequency Control Mode switch in the Read Freq position and operate the radio in the same manner as done for the Normal position of the Frequency Control Mode switch. Any desired channel may be loaded with a desired frequency and tested for Simplex operation as above. Any channel from 00 through 99 may be selected and programmed with the same receive and transmit frequency without regard for its former contents. Any previous frequency stored in a channel will be erased if a new frequency is loaded into that channel. If a channel already contains a useful frequency then obviously no new frequency should be stored in it. Instead store the new frequency in some unused channel to preserve the original frequency. To determine if a channel already contains a useful frequency, select the Read Freq mode and observe the display which will contain any receive frequency stored in that channel. Depress and hold the Load Xmt Pushbutton while observing the display. The display will contain any transmit frequency stored in that channel without causing the radio to transmit.

l) Loading Frequencies, Half-Duplex Operation: Turn the Freq Control switch to the Load Freq position. The Disable Light will turn on indicating that the radio is disabled. The Rec Light will be on. Set the two Channel Selector switches to the desired storage channel. Set the six Frequency Selector switches so that the display contains the desired receive frequency. Depress and release the Load Rec Pushbutton. Set the six frequency Selector switches so that the display contains the desired transmit frequency. Depress and release the Load Xmt Pushbutton. The Rec Light will turn off and the Xmt Light will turn on while the Load Xmt Pushbutton is depressed. To verify that channel is loaded with the correct receive and the correct transmit frequency, turn the Freq Control Mode switch to the Read Freq position. The Disable Light should turn off and the display should contain the receive frequency loaded above. Press and hold the Load Xmt pushbutton. The Xmt Light should turn on and the Rec Light should turn off. The display should contain the transmit frequency loaded above. Release the Load Xmt button. Leave the Freq Control Mode switch in the Read Freq position and operate the radio in the same manner as done for the Normal position of the Frequency Control Mode switch. Note that the receive frequency is displayed while the radio is receiving and the transmit frequency is displayed while transmitting. As

in simplex operation, any desired channel may be loaded with a desired receive and a desired transmit frequency and tested for Half-Duplex operation as above. Any channel may be selected and programmed with a required receive frequency and a different required transmit frequency without regard for the former contents of the channel. Any previous information stored in a channel will be erased if a new transmit and a new receive frequency are loaded into that channel. If a channel already contains useful frequencies then obviously no new frequencies should be stored in it. Instead store the new frequencies in some unused channel to preserve the original frequencies. To determine if a channel already contains useful frequencies, select the Read Freq mode and observe the receive frequency contained in the display. To read the transmit frequency stored in the channel depress the Load Xmt Pushbutton while observing the display. The display will contain any transmit frequency stored in that channel without causing the radio to transmit.

m) Half-Duplex Limitations: Half-Duplex operation requires one frequency for reception and a separate, discrete frequency for transmission. These two frequencies are normally separated from one another by less than 500 kHz. This is required primarily by the selectivity characteristics of the antenna coupler. The coupler is tuned to the transmit frequency, so received signal strength degrades as the separation between the two frequencies is increased. However, the two frequencies are normally close to each other also because of the propagation characteristic of the two frequencies. The propagation characteristic of two frequencies is such that the greater the separation of the two frequencies, the more variation in path length and the more fading will be noticed. (Typical Marine public correspondence stations have 300 to 400 kHz separation between transmit and receive frequencies.) Consequently, for best Half-Duplex operation, never store in a Half-Duplex channel a transmit and a receive frequency that are more than 500 kHz apart.

The GSB-900SC input and output filter networks, used to reduce harmonics and cross channel interference, are banded for the following frequency ranges:

Band 1	1.6 - 1.9999 MHz
Band 2	2.0 - 2.9999 MHz
Band 3	3.0 - 3.9999 MHz
Band 4	4.0 - 5.9999 MHz
Band 5	6.0 - 8.9999 MHz
Band 6	9.0 - 12.9999 MHz
Band 7	13.0 - 19.9999 MHz
Band 8	20.0 - 29.9999 MHz

In receive mode, these filters are bandpass networks, attenuating the received signal at frequencies above and below the band limits given above. In transmit mode, these filters are low pass networks, attenuating any transmit frequency above its upper band limit given above. If in a Half-Duplex mode the receive frequency is widely separated from the transmit frequency so that both are not in the same filter band, severe degradation of a received or transmitted signal may result if either the transmit or the receive frequency permanently selects the filter band for any Half-Duplex Channel. Further since the memory system of the GSB-900SC is comprised of Random Access Memory capable of producing only one frequency output at a time, any Half-Duplex channel with the transmit frequency in a different band than the receive frequency will select the transmit band filters when transmitting and the receive band filters when receiving. Consequently any Half-Duplex channel with the transmit frequency in a different band than the receive frequency will require several seconds for the radio to select the correct filter network in making the transition from either transmit mode to receive

mode or receive mode to transmit mode. Therefore, in a Half-Duplex channel avoid storing, if possible, a transmit and a receive frequency that are in different bands because the radio will always be ineffective for several seconds during the transition from transmit mode to receive mode or receive mode to transmit mode as it selects the correct filter network.

If the CW mode of operation is selected for a half duplex channel, do not store transmit and receive frequencies that are in different bands. This condition would cause the band select motor to continuously run (seeking either the transmit or receive filter network) as the CW key is depressed and released.

n) Two Frequency Simplex Operation: For simplex operation of two discrete frequencies, such as a day frequency and a night frequency, any channel may be programmed with one frequency and a nearby channel may be programmed with one frequency and a nearby channel may be programmed with the other frequency. Then when the channel selector is rotated from the first channel to the second one, only the antenna coupler, if used, must be retuned since the radio automatically selects the proper filter network for any operating control frequency.

o) Master Clear Operation: Rotate the Frequency Control Mode keylock switch to the Load Freq position. Depress and release the Master Clear Pushbutton using the eraser end of a pencil or some other suitably shaped object that will fit inside the pushbutton guard. When the Master Clear Pushbutton is released, the frequency display should briefly contain all zeros before again displaying the number selected by the frequency switches. Both the Xmt Light and the Rec Light should be dimly illuminated briefly before the Rec Light again turns on at full brightness. The above activity clears to zero the entire contents of the GSB-900SC memory system. The purpose of this feature is to remove from the memory system all obsolete or forgotten frequencies so that only new and useful frequencies may be added with the knowledge that any unused channel is clean and empty of anything but zero. In this manner a new record of the contents of the memory system may be made in the event that the old record is lost or incomplete. A second purpose of this feature is to provide a means to instantaneously erase all frequencies in memory in the event that all records of operating frequencies require quick destruction. In this event once the Master Clear Pushbutton clears all of the memory system, the Frequency Control Mode keylock switch may be rotated to the Read Freq or the Secure position and the key removed from the keylock switch. This action will lock the radio into a position where it will be useless to anyone who uses it without permission since with every channel containing zero and no way to select the Load Freq mode or the Normal mode to change that fact, the radio will be permanently disabled.

p) Secure Operation: Rotate the Frequency Control Mode keylock switch to the Load Freq position. Depress and release the Master Clear pushbutton if an empty memory is desired for this operation. Select in turn all desired frequencies and load these frequencies into the channel desired for each frequency. Rotate the Frequency Control Mode keylock switch to the Secure position. The frequency display will blank with the exception of the decimal point, which stays illuminated to indicate that the memory system is functioning. Remove the key from the Frequency Control Mode Keylock switch. The radio is now locked into a mode that both restricts knowledge of its operating frequencies and prevents change of any frequencies set in any channel. In this mode an operator must be informed, by channel number, as to which channels to use at all times.

q) Low Battery Light: If the Low Battery Light (LOW BTRY) on the GSB-900SC Front

Panel illuminates when the radio is turned on, replace the batteries, located on the Power Supply Battery Assembly behind the front panel. The light indicates that the batteries are weakening, and should be replaced as soon as possible. See Section 4.2.9.3; Power Supply Battery Assembly and Figure 3.3 below.

3.5 GRC 951 AUDIO REMOTE CONTROL UNIT

To transmit, first check that the MODE switch on the GSB-900SC is placed in the correct operating mode. Depress the push-to-talk (PTT) button on the handset or microphone connected to the GRC-951 and speak in a normal voice. Observe that the meter on the GSB-900SC indicates approximately 1.0 relative power on voice peaks.

tuneup is complete, adjust the VOLUME control on the GRC-951 for a comfortable listening level.

NOTE

The level in the GRC-951 speaker is not affected by the setting of the GSB-900SC VOLUME control.

Before placing the GRC-951 Audio Remote Control unit into operation, make sure that the system adjustments outlined in section 2.7 have been performed. Connect the microphone or handset to connector J1 on the front of the GRC-951. Refer to section 3.5 or 3.6 and tune the GSB-900SC into its antenna at the operating frequency. When

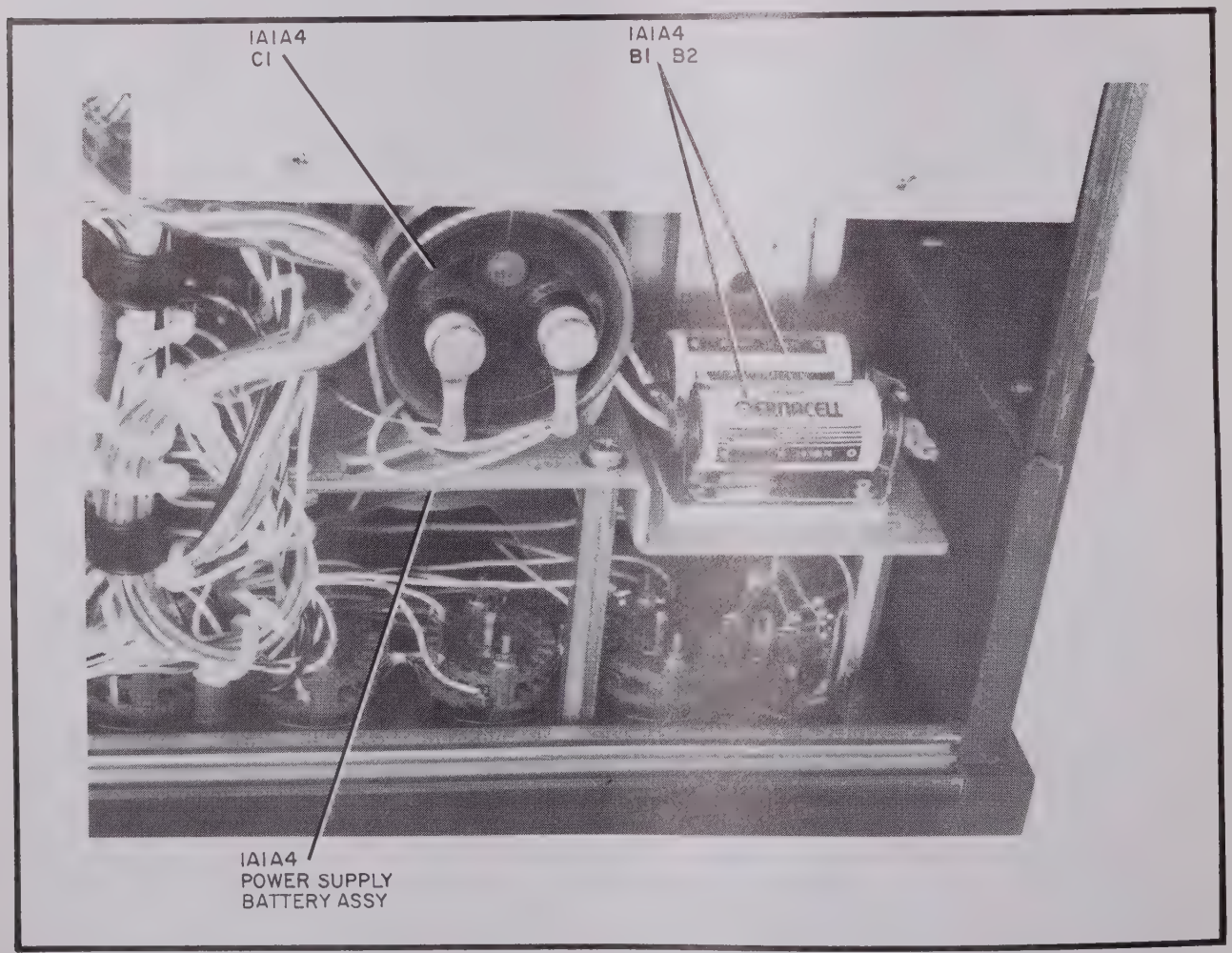


Figure 3.3 GSB-900SC Power Supply Battery Assembly 1A1A4

SECTION 4

THEORY OF OPERATION

4.1 GENERAL

The discussion of the theory of operation of the GSB-900SC will be presented in nine parts: synthesizer, memory system, receiver, exciter, RF power amplifier, power supply, filter module, antenna tuning control, and meter panel. Each part will contain a block diagram discussion followed by a detailed explanation of the circuit theory.

4.1.1 OVERALL BLOCK DIAGRAM

Figure 4.1 shows an overall block diagram of the GSB-900SC. Discussion of the various functions and circuits is presented in the sections following.

4.2 SYNTHESIZER 1A4

This unit consists of six printed circuit boards: Spectrum Generator (1A4A1), Low Digit Generator (1A4A2), Translator (1A4A3), VHF Divider (1A4A4), VCO (1A4A5) and the Synthesizer Mother board (1A4A6). Figure 4.3 shows an overall block diagram of the synthesizer. An isometric drawing of the physical components of the synthesizer unit is shown in Figure 5.6.

4.2.1 GENERAL

The synthesizer (1A4) generates the three local oscillator injection frequencies needed to determine the operating frequency of the radio. The synthesizer input is the 5 MHz reference signal from the Frequency Standard. The three local oscillator injection frequencies are obtained from the 5 MHz reference by a combination of direct synthesis and digital phase lock techniques. The frequency accuracy of the radio is therefore solely determined by the accuracy of the Frequency Standard.

The 3rd L.O. (10.5 MHz reference) is derived by direct synthesis techniques (i.e. by dividing and mixing). This local oscillator signal is used as a product detector injection on receive and as a carrier generator on transmit. This reference is derived in the Spectrum Generator assembly, 1A4A1.

The 2nd L.O. generator consists of a crystal oscillator at a nominal frequency of 80.7500 MHz located in the Translator assembly (1A4A3). This frequency is used in the VHF Mixer assembly (1A3A1), in the Receiver/Exciter, to convert the 1st I.F. frequency of 91.2500 MHz to the 2nd I.F. of 10.5 MHz. Since the 2nd L.O. oscillator is not referenced to the Frequency Standard, a small frequency error can exist on this L.O. However, because of the mixing scheme used in the Translator, this same error appears on the 1st L.O. frequency and is therefore cancelled at the output of the VHF Mixer.

The VCO (1st L.O.) generator is a phase locked oscillator covering the frequency range of 91.2500 to 121.2499 Hz in 100 Hz steps. The exact frequency of the oscillator is given by:

$$F_1 = 91.2500 + F_0 + e \text{ (MHz)}$$

Where: F_1=1st L.O. frequency

F_0=dialed frequency

e=2nd L.O. error

On receive, the 1st L.O. is used to convert the incoming signal up to the 1st I.F. frequency (91.25 MHz). On transmit, the 1st L.O. is used to convert the transmit signal at the 1st I.F. frequency down to its final operating frequency.

4.2.2 SPECTRUM GENERATOR -1A4A1

Refer to Figure 5.12.

4.2.2.1 GENERAL

The Spectrum Generator (1A4A1) generates the fixed reference frequencies needed in the syn-

thesizer. The input is the 5 MHz reference from the Frequency Standard and the outputs consist of references at the following frequencies: 10.5 MHz (Product Detector), 21 MHz (to Translator), 20 MHz (to Translator), 17 MHz (to Low Digit Generator), 100 kHz (to VHF Divider), and 1 kHz (to Low Digit Generator).

4.2.2.2 20 MHz REFERENCE GENERATOR

The 5 MHz Reference from the Frequency Standard is amplified by U1 and formed into a short pulse by pulse generator U2. The forth harmonic of this 5 MHz pulse (i.e. 20 MHz) is filtered by the double-tuned circuit (C7, C8, C9, C10, L2 and L3) and is amplified by U3. The output is obtained from U3 through Pi Network (C14, C15, C16, C17, L4) which matches the high output impedance of U3 to 50 ohms. A portion of this signal is also applied to the 17 MHz mixer and to Buffer Amplifier U8.

4.2.2.3 1 MHz, 100 kHz and 1 kHz REFERENCE GENERATOR

The 5 MHz output pulse from U2A is fed to U4, a divide-by-5 counter. The resultant 1 MHz output is fed to three stages of divide-by-10 counters (U5, U6 and U7); thereby producing the desired 100 kHz and 1 kHz outputs.

4.2.2.4 17 MHz REFERENCE GENERATOR

The 1 MHz pulse from U4 is passed through a tuned circuit (L14, C53) which is tuned to 3 MHz (i.e. the 3rd harmonic of the 1 MHz). This 3 MHz signal is amplified by Q5, further filtered by another tuned circuit (L15, C55) and applied as one input to mixer Q6. A portion of the 20 MHz reference is also applied to Q6. The resultant 17 MHz signal is filtered by a double-tuned circuit (L16, C59, C62, L17, C65 and C66) and is applied to a complementary emitter follower (Q7, Q8). The emitter follower matches the high output impedance of mixer Q6 to 50 ohms.

4.2.2.5 21 MHz REFERENCE GENERATOR

The 1 MHz pulse from U4 is passed through a tuned circuit (L7, C30) which filters the pulse into a 1 MHz sine wave. Complementary emitter follower (Q1, Q2) transforms the impedance to 50 ohms to match the input impedance of the balanced mixer.

The 20 MHz reference from U3 is amplified by U8 and applied as the second input to the balanced mixer. The resultant 21 MHz signal is filtered by triple-tuned circuit (C32, C33, L8, C34, L9, C35, C36, L10, C37, and C38) and then amplified by U9. The output of U9 is matched to 50 ohms by emitter follower, Q9.

4.2.2.6 10.5 MHz REFERENCE GENERATOR

The 21 MHz output from U9 is also fed to flip-flop U10 which generates a 10.5 MHz square wave. The signal is filtered to a sine wave by a double-tuned circuit (L12, C46, C47, L13, C48, and C49) and then matched to 50 ohms by emitter follower , Q4.
The flip-flop (U10) is disabled by switch (Q3) in the AM receive mode to prevent a "beat"note from appearing at the receiver output. +12 volts, applied to the "Blanking Pulse In" line in these modes, saturates Q3; thereby disabling the flip-flop and effectively removing the 10.5 MHz output. At all other times there is no voltage on the "Blanking Pulse In" line. Q3 is therefore cut off and the flip-flop (U10) operates in its normal divide-by-2 mode. A blanking pulse from the L.O. Blanker on Mother board 1A4A6 also disables the flip-flop for approximately 100 milliseconds when ever the setting of the 1 MHz frequency switch on the front panel is changed.

4.2.3 LOW DIGIT GENERATOR – 1A4A2

Refer to Figure 5.13.

4.2.3.1 GENERAL

The Low Digit Generator (1A4A2) generates the 100 Hz, 1 kHz and 10 kHz synthesized frequency steps. The inputs are the 17 MHz reference (from the Spectrum Generator), 1 kHz reference (from the Spectrum Generator), BCD frequency control lines (from the front panel frequency control switches) and the Coarse Steering voltage (from the 10 kHz frequency control switch on the front

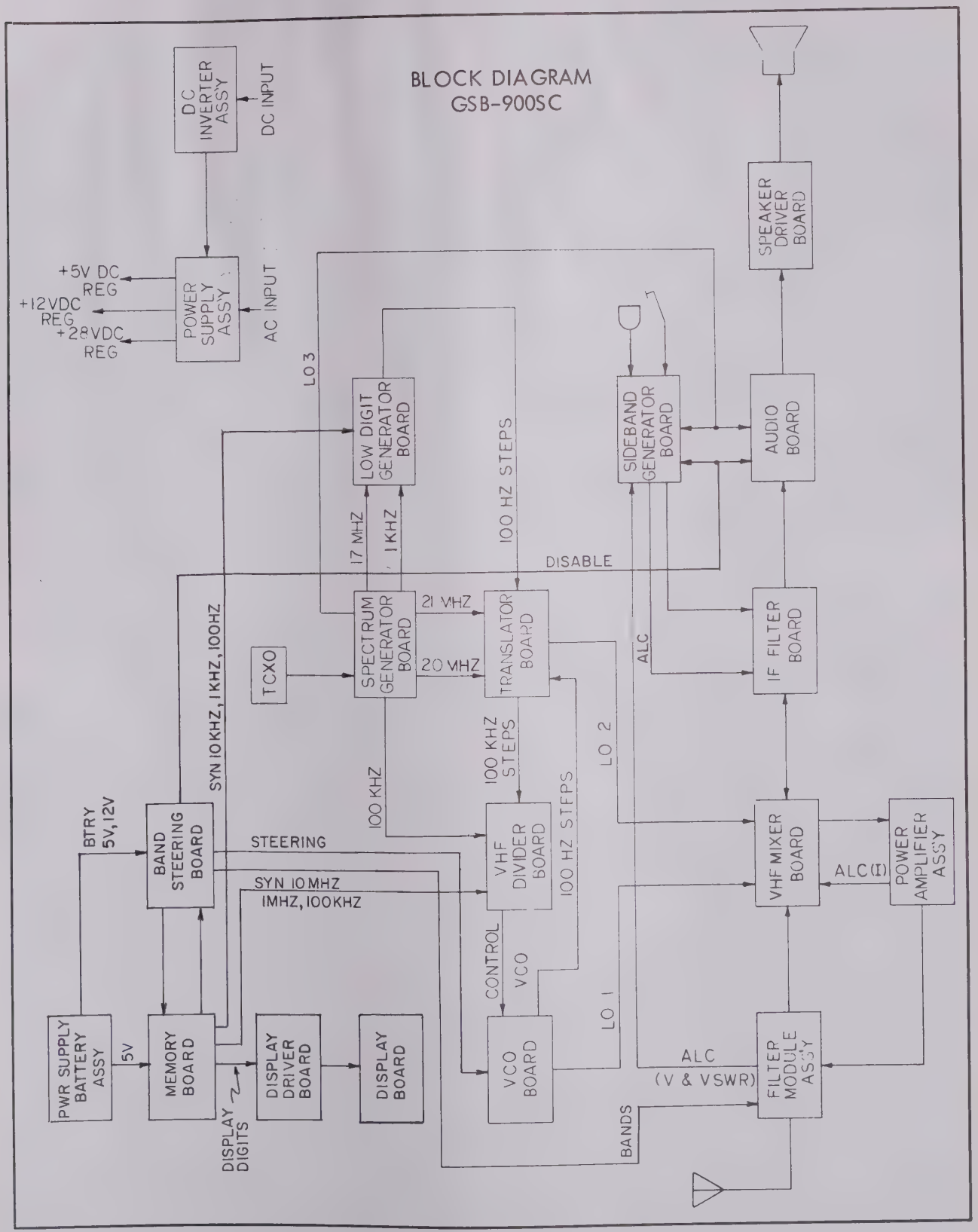


Figure 4.1 GSB-900SC Overall Block Diagram

panel). The output is 1.5000 to 1.5999 MHz in 100 Hz steps and is fed to the Translator as a mixing reference.

4.2.3.2 VOLTAGE CONTROLLED OSCILLATOR

The Voltage Controlled Oscillator or VCO (Q1) is a Colpitts oscillator covering the range of 15.000 to 15.999 MHz. Coarse frequency tuning is provided by the action of the Coarse Steering voltage on varactor diodes CR1 and CR2. Fine frequency control is provided by the Phase Detector (U2) acting through the loop filter (R8, C7, R5 and C3) and 1 kHz notch filter (R4, C6, R6, C5, C4, C68 and R3) on varactor diodes CR3 and CR4. The oscillator output is loosely coupled through C15 to isolation amplifier U1.

The VCO is fed from a voltage regulator (R9, CR5, Q2 and R10) which provides a finely regulated 7.6 volts.

4.2.3.3 MIXER AND PULSE GENERATOR

The mixer (Q3) transforms the VCO frequency to 2.000-1.001 MHz to place the signal in the range of the Preset Counters. The inputs to the mixer consist of the VCO signal (fed from the output of U1) and the 17 MHz reference. The output of the mixer is filtered by a 2.5 MHz low pass filter (C23, C24, L7, C25, C26, L8 and C27) and is then amplified by U6. Quad NAND Gate, U7, connected as a monostable multivibrator, forms the signal into a short pulse to drive the preset counter.

4.2.3.4 PRESET COUNTER

The Preset Counter (U8, U9, U10, U11) is a counter whose division ratio is controlled by the 100 Hz, 1 kHz and 10 kHz Frequency control switches on the front panel. During the normal counting interval, the counter functions as a divide-by-2000 counter. During the Preset interval, the clock is disabled and the counter is loaded (or preset) to a count determined by the settings of the frequency control switches. The frequency control information is entered in binary-coded-decimal (BCD) format and the division ratio, D, is therefore determined by the formula:

$$D = 2000 - (100\,N_{10kHz} + 10\,N_{1kHz} + N_{100Hz})$$

where:

N_{10kHz} N_{1kHz} and N_{100Hz} are, respectively, the settings of the 10 kHz, 1 kHz and 100 Hz frequency dials.

Or, for example:

DIAL SETTINGS			PRESET	COUNT (D)
10 kHz	1 kHz	100 Hz		
0	0	0	000	2000
0	0	1	001	1999
0	0	2	002	1998
0	1	1	011	1989
1	9	9	199	1801
9	9	9	999	1001

4.2.3.5 PRESET GENERATOR

The preset generator applies a short pulse to the data strobe inputs of the preset counter when a full count is detected. A "look ahead" scheme is employed to eliminate miscounting due to the propagation delays in the counter. When the counter has reached a count of 1999, the inputs to pins 2, 3, 4, 5, 6, 11, and 12 of NAND gate U3 will be in a "one" state. As soon as the clock input to pin 1 of this gate returns to a "one" state, the output of U3 will change to a "zero" state, thereby triggering monostable multivibrator U4. Then U4 presets the counters by applying a "zero" to their data strobe inputs for approximately 100 nsec. The output of U4 will return to a "one" state before the beginning of the next clock pulse.

4.2.3.6 PHASE DETECTOR, LOOP FILTER and 1 kHz NOTCH FILTER

The phase detector compares the frequency of the output of the Preset Counter with that of the 1 kHz reference from the Spectrum Generator. Action of the phase detector is as follows:

If the VCO frequency is high, the output frequency of mixer Q3 will be low. The output frequency of the Preset Counter will, therefore, also be low. The Phase Detector output voltage will decrease until the frequency error is corrected. Conversely, if the VCO frequency is low, the mixer output frequency will be high and the Phase Detector will increase until the error is corrected. If there is no frequency error, the output voltage of the Phase Detector will remain constant. The Loop Filter (R8, C7, R5, and C3) removes any 1 kHz components in the Phase Detector output and also determines the transient response of the loop. The 1 kHz frequency components are further attenuated by twin tee notch filter R3, R4, R6, C4, C5, C6, and C68. The action of this Phase Lock Loop is to make the VCO frequency follow the relationship: F_{VCO}=17.000-D (kHz); where D is the count ratio. The VCO will therefore vary from 15.000 to 15.999 MHz in 1 kHz steps.

4.2.3.7 OUTPUT DIVIDER CIRCUITRY

The output from Buffer U1 is further amplified by Q5 and fed to divide-by-10 counter U5. The output of U5 is filtered to a sine wave by a bandpass filter (L11, C39, C40, C41, and L13) and is fed to emitter follower, Q6 which matches the output to 50 ohms. The output from the Low Digit Generator is 1.5000 to 1.5999 MHz in 100 Hz steps and follows the relationship:

$$F_{OUT} = 1.5000(MHz) + N(kHz)$$

where N=knob settings of the 10 kHz, 1 kHz and 100 Hz (i.e. 0.1 kHz) dials.

4.2.4 TRANSLATOR–1A4A3

Refer to Figure 5.14.

4.2.4.1 GENERAL

The translator (1A4A3) combines the signals from the Low Digit Generator (1A4A2) and VCO (1A4A5) and generates a signal which, after subsequent frequency division in the VHF Divider (1A4A4), is used to phase lock the VCO to the proper frequency. The second L.O. and V.F.O. signals are also generated in this assembly. The inputs to this assembly are: 20 and 21 MHz references (from the Spectrum Generator); 1st L.O. (from the VCO); 1.5000-1.5999 MHz (from the Low Digit Generator); and the V.F.O. Control and V.F.O. ON/OFF signals from the front panel. The output is the 10.0-39.9 MHz reference signal which is fed to the VHF Divider. In the V.F.O. mode, the internally generated 21 MHz V.F.O. is substituted for the 21 MHz reference from the Spectrum Generator.

4.2.4.2 ERROR CANCELLING

Since the 2nd L.O. is a free running crystal oscillator and is not referenced to the Frequency Standard, a small frequency error can exist. However, because of the mixing scheme employed in this assembly, both the 1st L.O. and 2nd L.O. will have the same frequency error. This error will therefore be cancelled in the VHF Mixer Assembly (1A3A1).

4.2.4.3 V.F.O. AND 21 MHz REFERENCE AMPLIFIERS

The V.F.O. (Q1) is a Colpitts Crystal Oscillator, covering the frequency range of 20.995 to 21.005 MHz and thereby providing approximately ±5 kHz tuning adjustment around the dialed frequency of the radio. The V.F.O. control voltage, acting on varactor diodes CR6 and CR7 in series with the crystal, "pulls" the crystal's oscillation frequency to provide this small frequency change. The tuned circuit in the collector of Q1 (L23,C101) adjusts the circuit to resonance at 21 MHz. Inductor L22, in series with crystal Y1, compensates for small variations in the oscillation frequency of the crystal thus adjusting the center frequency of the oscillator to 21.0000 MHz. The oscillator output is buffered and amplified by U2 when in the V.F.O. mode. The 21 MHz reference from the spectrum generator is amplified by U1 when the V.F.O. mode is not selected.

In the V.F.O. mode, +12V appears on the V.F.O. ON/OFF input line. This applies base bias to Oscillator Q1 and turns on amplifier U2 through transistor switch Q3. When the V.F.O. mode is not selected, the voltage on the V.F.O. ON/OFF line is removed, amplifier U1 is activated and the oscil-

lator (Q1) and amplifier (U2) are turned off. The 21 MHz reference from the Spectrum Generator therefore controls the frequency of the radio.

Emitter Follower Q2 and the network consisting of R67, R68, R69, CR8, CR9, CR10, and CR13, CR14, CR15 compensate for the nonlinear frequency vs. voltage characteristic of the varactor diodes. The V.F.O. Control voltage from the front panel is applied to varactor diodes CR6 and CR7 through this network, thereby providing the desired small frequency swing around 21 MHz.

4.2.4.4 2nd L.O. CIRCUITRY

The 2nd L.O. (Q7) is a Colpitts crystal oscillator of similar design to the V.F.O. Tuned circuit L17, C46, and C47 tunes the circuit to resonance at 80.75 MHz. A small sample of oscillator output is taken from the junction of C46, C47 and Y2 and is fed to Amplifier Q9. The 2nd L.O. output to the receiver/exciter module is taken from the drain of Q9 through pi network C67, L25 and C68 which matches the output to 50 ohms.

4.2.4.5 100.75 MHz MIXER

The 100.75 MHz mixer (Q8) heterodynes the 2nd L.O. output from Q7 and the 20 MHz reference from the Spectrum Generator. The triple tuned 100.75 MHz bandpass filter selects the desired sum frequency while rejecting the 80.75 MHz and 60.75 MHz components. Tuned circuit L28, C72 prevents loading of the 20 MHz signal by the oscillator. Tuned circuit L27, C71 prevents the loading of the oscillator by the pi network. Pi network C48, L18, C49 transforms the 50 ohm input impedance to 200 ohms thereby increasing the voltage level by approximately 2:1 to ensure adequate mixer drive. Test point TP3 provides a convenient 50 ohm test point for the connection of a spectrum analyzer or any other suitable measuring instrument to aid in bandpass filter alignment.

4.2.4.6. BALANCED MIXER

Depending on the mode selected, the balanced mixer heterodynes the 1.5000–1.5999 MHz output of the Low Digit Generator and either the 21 MHz reference or V.F.O. The mixer is a doubly-balanced mixer design using hot carrier diodes and balun transformers. The 19.45 MHz bandpass filter selects the desired difference frequency. The output is fed to U3 where the signal is amplified and further filtered by tuned circuit L5-C17. Automatic Gain Control (AGC) is provided by diodes CR5, CR12 and their associated circuitry to ensure a constant and proper level to the 81.25 MHz mixer. Test point TP1 provides a well isolated point for observation of the signal without appreciable loading of the tuned circuit.

4.2.4.7 81.25 MHz MIXER

The 81.25 MHz Mixer combines the 19.5000-19.4001 MHz signal from amplifier U3 and the 100.7500 MHz signal from mixer Q8 to produce the difference frequency of 81.2500-81.3499 MHz. The 81.25 MHz bandpass filter (L7, C20, L38, C21, L8, C22, C23 and C24) selects the desired difference frequency. A well-isolated test point, TP2, is also provided here to permit observation of the signal with 50 ohm equipment.

4.2.4.8 OUTPUT MIXER AND BROADBAND AMPLIFIER

The output mixer, Q4, heterodynes the 81.25 MHz mixer output and the VCO sample from the VCO assembly (1A4A5). The VCO sample is fed to the mixer through balun transformer T3 which transforms the signal to a 200 ohm impedance level to ensure adequate voltage drive to the mixer. The mixer output is filtered by a 10-50 MHz bandpass filter (L9, C29, L10, C86 and L11) and then transformed to a low impedance by emitter follower Q10. Potentiometer R54 in the base circuit of Q10 permits output level adjustment. The output of Q10 passes through 50 MHz Low Pass Filter (C74, C75, L30, C76, C82, C77, L31) to the broadband amplifier (Q5, Q6). Negative feedback around the the amplifier (R17, R19, R6) provides flat gain to well beyond 50 MHz as well as a constant input impedance, stable D.C. operating point, and low output impedance.

4.2.5 V.H.F. DIVIDER–1A4A4

Refer to Figure 5.15.

4.2.5.1 GENERAL

The V.H.F. Divider (1A4A4) contains a divide-by-400 high speed preset counter which forms the 10 MHz, 1 MHz and 100 kHz frequency steps. A phase detector compares the frequency and phase of the output of this counter with that of the 100 kHz reference from the Spectrum Generator (1A4A1) and developes a fine steering correction voltage which is fed back to control the frequency of the VCO (1A4A5). This "phase lock loop", by controlling the VCO frequency, forces the input to the V.H.F. Divider to follow the relationship:

$$F_{in} = 10.0 + 10\,N_{10\,MHz} + N_{1\,MHz} + 0.1\,N_{100\,kHz}$$

where: $N_{10\,MHz}$ = the 10 MHz digit

$N_{1\,MHz}$ = the 1 MHz digit

$N_{100\,kHz}$ = 100 kHz (i.e. .1 MHz) digit

and F_{in} is given in MHz

The input frequency therefore varies from 10.0 to 39.9 MHz in 100 kHz steps. The 10 MHz input corresponds to dial settings of "000" whereas the 39.9 MHz input corresponds to dial settings of "299" on the 10 MHz, 1 MHz and 100 kHz dials respectively.

The inputs to the V.H.F. Divider are: the 100 kHz reference (from the Spectrum Generator): the output signal from the Translator; the frequency control lines from the 1 MHz and 100 kHz switches on the front panel (8 wires); and the 10 MHz preset lines (from the V.C.O.). The output is the fine steering voltage which is fed back to the V.C.O.

4.2.5.2 BROADBAND AMPLIFIER

The broadband amplifier consists of a two stage feedback amplifier (Q1,Q2) followed by a complementary emitter follower (Q3,Q4). The negative feedback network, (R6,R7,R4) around Q1 and Q2, provides flat gain to well beyond 50 MHz, a constant input impedance over the frequency range, and stable D.C. operating point. R1 establishes the the input impedance of this amplifier at 50 ohms. The output of the feedback amplifier is fed to the complementary emitter follower (Q3, Q4). This emitter follower provides a low driving impedance for the subsequent high speed prescaler, and also establishes the proper logical zero and logical one levels to be compatible with the subsequent TTL logic integrated circuits.

4.2.5.3 PRESCALER

The prescaler (U2) is a high speed dual flip-flop connected in a conventional divide-by-four configuration. It's output is buffered by NAND gate AlC so as not to place excessive loading on U2.

4.2.5.4 PRESET COUNTERS

The preset counters (U3, U6, U7) consist of two stages of preset decade counters (U3, U6) followed by a preset divide-by-four dual flip-flop (U7). U7 is preset by quad two input NAND gate U13 and the A and B sections of quad two input NAND gate U8. During the normal counting mode (that is, when the counters are not being preset) the data strobe (D_S) lines on U3 and U6 are held in a "1" state by preset flip-flop U10. This permits these counters to function in their normal divide-by-ten mode. Similarly, the 10 MHz preset bus is held in a "0" state by U10. This forces the outputs of gates U8A and U8B and, therefore, the preset inputs to dual flip-flop U7, to be in a "1" state. Also the outputs of U13C and U13D, and therefore the clear inputs to U7 are forced to a "1" state. U7, therefore, counts in its normal divide-by-four mode. During the preset interval, the D_S lines to U3 are held in a "0" state by U10 and the inputs to U8A, U8B, U13C and U13D are held in a "1" state by U10. The clock pulse to the counters is inhibited and the preset information from the 10 frequency control lines is entered into counters U3, U6 and U7.

4.2.5.6 100 kHz CARRY GENERATOR

When all four 100 kHz preset lines are programmed to a "0" state by the front panel switches (corresponding to a dial setting of 0 on the 100 kHz frequency control), a special "carry" signal must be generated to program the counters to the correct division ratio.

Mathematically, this is necessary because a dial

setting of zero requires the input counter, U3, to divide by zero--an impossible operation. The count is corrected by programming U3 to divide-by-ten in this state and then subtracting one count from the next decade counter. Note that this is the same mathematical operation of "borrowing" when, for example, one subtracts nine from ten.

Quad two input NAND gate U4 is connected as a quad inverter with a common output. One of the four 100 kHz input lines is connected to each section of the gate. This special gate is of the "open collector" type enabling all four outputs to be connected together. The output of U4 is inverted by U5A. If all four inputs to U4 are zero, (dial set to "0" on the 100 kHz switch), the output of U4 will be in a "one" state and the U5A output will be a "zero". If any of the 100 kHz inputs are in a "1" state, the U5A output will also be a "1"

4.2.5.7 PRESET GENERATOR

During the normal counting interval, the Q output of flip-flop U10 is in a "1" state, the preset bus is in a "1" state and the 10 MHz preset bus is in a "0" state. In order to count properly, the presetting must occur between input clock pulses. A "look ahead" scheme is therefore employed to eliminate the propagation delays through the various counters.

First assume that the 100 kHz dial is not in the "0" position (that is, that the output of U5A is in a "1" state). When the preset counter has reached a count of 399 (that is, one count from being filled); counter U3 will have a count of "9" (or binary 1001), U6 will have a count of "9" (or binary 1001) and U7 will have a count of "3" (or binary 11). The output of 8 input NAND gate U9 will sense this unique state and will go to a "0" state. U8C inverts this output to a "1" state, making the K1 input to master/slave flip-flop U10 a "1". On the next transition of the U3 input clock to a "0" state, the Q output of U10 will toggle to a "0" state and, therefore, the preset bus will be in a "0" state and the 10 MHz preset bus will be in a "1" state. Presetting will therefore occur. On the next transition of the U3 input clock back to a "1" state, the output of U8D will transition from a "1" to a "0" state, applying a "0" to the preset input (P) of U10 and forcing the Q output of U10 back to a "1" state. This terminates the preset cycle, and the normal counting sequence is restored.

If the 100 kHz dial is set in the "0" position, the U5A output will be in a "0" state. The output of carry gate U5B will therefore always be in a "1" state and will not follow the Q_A output of U6. Flip-flop U10 will now be "armed" at the 389th counter state instead of at the 399th state. The desired "carry" of ten counts will therefore occur.

4.2.5.8 PHASE DETECTOR

The 100 kHz reference from the Spectrum Generator is divided in frequency by four to 25 kHz by dual flip-flop U11. In the phase detector (U12), the frequency and phase of the output of the preset counter is compared with that of the 25 kHz reference and a fine steering correction voltage is fed back to control the frequency of the V.C.O. (1A4A5). This feedback voltage changes in the correct direction to bring the V.C.O. into phase lock. The phase detector operates in the following manner: If the frequency of the preset counter output is greater than that of the 25 kHz reference, the phase detector output will decrease in voltage. If the frequency of the preset counter output is less than that of the 25 kHz reference, the phase detector output will increase in voltage. If the two frequencies are exactly the same, the phase detector output will remain constant

4.2.6 V.C.O.–1A4A5

Refer to Figure 5.16.

4.2.6.1 GENERAL

The V.C.O. (1A4A5) generates the variable frequency 1st L.O. signal which controls the operating frequency, F_O, of the radio. This signal is generated in three voltage controlled oscillators each covering a 10 MHz frequency range, and selected by the 10 MHz switch on the front panel of the radio. The frequency ranges of the oscillators are (assuming a 2nd L.O. frequency of nominal 80.7500 MHz):

OSCILLATOR	F_0 RANGE (MHz)	VCO FREQUENCY RANGE (MHz)
Band 0	0.0000 to 9.9999	91.2500 to 101.2499
Band 1	10.0000 to 19.9999	101.2500 to 111.2499
Band 2	20.0000 to 29.9999	111.2500 to 121.2499

The actual oscillator frequencies will deviate from the above by an amount equal to the difference between the actual 2nd L.O. frequency and its nominal 80.7500 MHz.

The exact operating frequency of the oscillators is controlled by two independent D.C. voltages, designated coarse and fine steering. Each steering voltage is applied to a voltage variable capacitance diode (varactor) connected across the oscillator tank circuit. The coarse steering voltage is derived from a precision voltage divider located on the 1 MHz frequency control switch on the front panel. This voltage sets the oscillator frequency within the acquiring range of the phase lock loop. The fine steering voltage is derived from the phase detector on the V.H.F. Divider (1A4A4) after subsequent filtering by the loop filter. This voltage is the D.C. feedback within the phase lock loop which forces the oscillator to the correct frequency.

The oscillator outputs are buffered by two independent amplifiers: one providing the output to the Receiver Exciter module (1A3) and the other providing the oscillator sample to the Translator (1A4A3). Two transistor switches develop the 10 MHz preset signals for the V.H.F. Divider (1A4A4).

4.2.6.2 OSCILLATORS

The three oscillators are of identical design and, therefore, only the "Band 0" Oscillator will be discussed. The "Band 0" Oscillator is a conventional Colpitts oscillator employing a low noise dual gate MOSFET(Q6). The resonant tank circuit consisting of C20, C21, L1, C16, CR3 and CR4 determines the oscillation frequency of the circuit. Feedback is provided by C20 and C21. Two point tracking of the oscillator frequency is provided by L1 at the low frequency end of the band and C16 at the high frequency end. The coarse steering voltage from a resistor string on the 1 MHz switch is applied to voltage variable capacitance diode (varactor) CR3 through the filter network (C10, R26, C11, and R27) and RF bypass network (R28, C12, R29 and C13). Fine steering voltage from the phase detector in the VHF Divider assembly, 1A4A4, is applied to varactor diode CR4 through the loop filter (R23, C7, R24, C8, R25, and C9) and the 25 kHz twin tee notch filter (R20, C5, R22, C3, C4, R21 and C6). The output is taken from the drain of Q6 through C22. Hot carrier diodes CR5 and CR6 prevent the RF signal from biasing the varactor diodes into their conducting region.

4.2.6.3 OUTPUT BUFFER AMPLIFIER

The output of each oscillator is fed to the output buffer amplifier (Q9, Q10). This amplifier is a conventional cascode configuration providing high input impedance, high isolation, and negligible feedback. The output of the amplifier is fed through bandpass filter (C46, L11, L12, C48, L13, and C50) and matching transformer (T1) to the Receiver/Exciter module.

4.2.6.4 TRANSLATOR BUFFER AMPLIFIER

The translator buffer amplifier (Q11, Q12) is similar in operation to the output buffer. The output is taken from the collector of Q11 through C54 and matching transformer T2.

4.2.6.5 LOGIC SWITCHING

Transistors Q3, Q4 and Q5 apply +12 volts to the appropriate oscillator circuit when the respective band command line is connected to ground by the 10 MHz switch on the front panel. Transistors Q1 and Q2 generate the required 10 MHz preset code

for the VHF Divider (1A4A4) in the following sequence:

10 MHz switch Position	2^0 Preset logic level	2^1 Preset logic level
0	0	1
1	1	0
2	0	0

NOTE

The TTL compatible logic levels are as follows:

Logical 0 = less than 0.8 volts
Logical 1 = greater than 2.0 volts but less than 5.0 volts

4.2.6.6 MECHANICAL

Refer to figure 5.6.

The V.C.O. board is secured between two metal plates (front and rear) that serve as a support and an electrical shield. This unit is rigidly mounted to the end plate of the synthesizer card guides to ensure superior performance under extreme vibration and shock conditions. Ability to make alignment adjustments is provided by access holes where necessary.

4.2.7 SYNTHESIZER MOTHER BOARD-1A4A6

Refer to figure 5.17.

The synthesizer mother board consists of five receptacles, and their related components and circuitry. It is mounted on four standoffs located on the chassis, under the synthesizer module, as shown in figure 5.6. The five printed circuit cards (1A4A1, 1A4A2, 1A4A3, 1A4A4, and 1A4A5), described previously in this section, insert into this mother board thereby constituting the entire synthesizer module.

4.2.7.1 L.O. BLANKER CIRCUITRY (PART OF SYNTHESIZER MOTHER BOARD 1A4A6)

The L.O. Blanker Circuitry protects the power amplifier from transients due to a frequency change while in the transmit mode. If the radio operator inadvertently changes the 1 MHz frequency dial on the front panel while in one of the transmit modes, the Synthesizer may momentarily change frequency by several MHz while the switch is between its detent positions. This would result in a large transient on the output and could damage the power amplifier.

When the setting of the 1 MHz switch is changed, the "preset 2^0 1 MHz" frequency control line will change from either:

a) logical "0" (approximately 0.2 volts) to logical "1" (approximately 3 volts) state

or

b) logical "1" to logical "0" state

In case a) a positive-going differentiated pulse is formed by differentiating network C8, R3, CR2 and R10 and is applied to the base of switch Q2 through R4. Q2 will saturate driving switch Q1 into conduction and generate a 12 volt blanking pulse through isolation diode CR4. The blanking pulse is applied to the Spectrum Generator (1A4A1) to blank the 3rd L.O. (10.5 MHz) output. The blanking duration is approximately 100 to 200 msec and is controlled by the time constant of the differentiating network.

In case b) a negative-going pulse is formed by differentiating network C2, R2, CR1 and R5 and is applied to the base of Q1 through R8. Q1 will saturate, forming the blanking pulse. Blanking duration is 100 to 200 msec and is controlled by the time constant of the differentiating network.

In the AM RECEIVE mode, +12 volts is applied to the output through isolation diode CR3. This blanks the 3rd L.O. while in this mode and prevents a beat note between the 3rd L.O. and the carrier of the received signal.

4.2.8 SYNTHESIZER PROGRAMMING

Figure 5.8 shows a wiring diagram of the front panel.

Synthesizer Programming is accomplished by circuitry located on the Memory Board, 1A1A7, of the Secure Channel memory system which is part of the front panel assembly of the GSB-900SC. The six Frequency Selector switches on the front panel control the Synthesizer Programming through the Memory Board, 1A1A7, when the Frequency control mode keyswitch is in either the Normal position or the Load Freq position. However, since the radio is disabled in the Load Freq mode to facilitate the loading of frequencies into the memory system, the synthesizer or its programming is meaningless in that case. In the Read Freq or the Secure mode, Synthesizer Programming is accomplished by the contents of the memories on the Memory Board, 1A1A7. The entire memory system and the six frequency switches operate in a Binary Coded Decimal (BCD) mode. However, since the 10 MHz, the 1 MHz and the 100 kHz inputs to the Synthesizer require programming other than BCD programming, the Memory Board, 1A1A7, contains Synthesizer Programming converters to produce the correct programming for those synthesizer inputs that do not require BCD. The Memory Board produces Inverted Decimal Programming for the Synthesizer 10 MHz input as illustrated in Table 5.9. The Memory Board produces Nines Complement Programming for the Synthesizer 1 MHz input as illustrated in Table 5.9. Finally the Memory Board produces Tens Complement Programming for the Synthesizer 100 kHz input as illustrated again in Table 5.9. In addition, the Memory Board, 1A1A7, provides BCD information to program the 10 kHz, the 1 kHz and the 100 Hz Synthesizer inputs. See Table 5.9. The Memory Board, 1A1A7, produces the correct Synthesizer Programming regardless of whether the Memory Board is operating from the six Frequency Selector switches or its own internal memory contents.

4.2.9 FREQUENCY DISPLAY

A schematic of the frequency display is shown in Figure 5.9. Figure 4.2 shows the location of the frequency display boards.

4.2.9.1 DISPLAY DRIVER

The Memory Board, 1A1A7, supplies information either from the six Frequency Selector switches or from the contents of its own internal memory to the Display Driver Board, 1A1A2, so that the LED display may be properly programmed. The LED display drivers, U1 through U6, all require a BCD (binary coded decimal) code to properly light the display. Since the entire memory system and the six frequency switches operate in a BCD mode, this BCD information is supplied by drivers on the Memory Board to the LED display drivers, U1 through U6, on the Display Driver Board.

The Display Driver Board, 1A1A2, contains circuitry to permit blanking of the displays on the Display Board, 1A1A3. Any time $\overline{\text{Display Blanking}}$,* which is input 2 of Display Driver Board, 1A1A2, is driven low from Band Steering Board, 1A1A6, the displays on Display Board, 1A1A3, are turned off. When $\overline{\text{Display Blanking}}$ is low, all inputs to Driver U7 are also low which causes outputs 3 and 5 of U7 to drive lows into pin 4 of both U1 and U2. Because $\overline{\text{Display Blanking}}$ is low, pin 4 of U3 through U6 will also be low. Anytime pin 4 of U1 through U6 is a low, all outputs of U1 through U6 become high thus turning off all displays.

Input pins 2 and 6 are grounded on U1 so that it can produce no display outputs great-

* See Logic Notes para. 5.10.13.

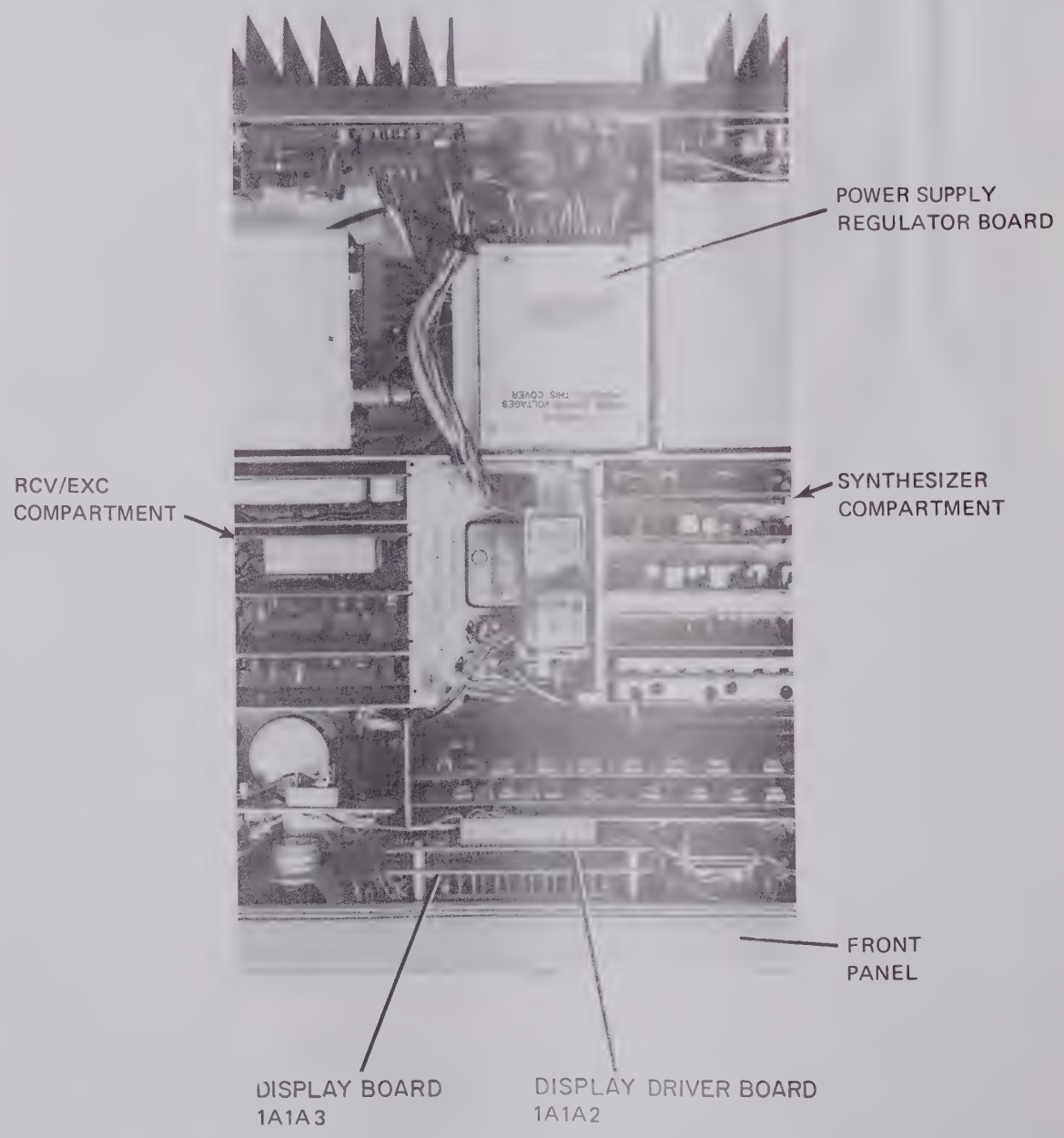


Figure 4.2 Top View Showing Display

er than 3. Input pin 5 of U1 is grounded so that anytime the BCD information associated with U1 is comprised of lows on pins 1 and 7 of U1, the outputs of U1 will all become high thus turning off the display digit driven by U1. This action effectively blanks any leading zero in the display. When input pins 1, 2, 6 and 7 of U1 are low, as they will be if the digit zero is selected in the 10 MHz position of the Memory system, pin 4 of U1 will become low thus forcing pin 5 of U2 low. Consequently, if input pins 1, 2, 6 and 7 are all low on Display Driver U2 when a digit zero is also selected in the 1 MHz position of the memory system, the outputs of U2 will all be high thus blanking the second leading zero of the display. By this mechanism, up to two leading zeros will be blanked by the Display Driver Board, 1A1A2.

The outputs of all six drivers are connected to 1A1A2J1.

4.2.9.2 DISPLAY

The six digit LED display board 1A1A3 plugs into the DECODER board via 1A1A3P1. Each segment is connected through an isolation resistor, R1 through R42, and the decimal point on U3 is energized through R43. The display intensity is changed by adjusting the supply voltage to the display anodes. This is done by S12 on the front panel. In the bright position, 5V is supplied to the LED's; and in the dim position, the voltage is dropped to 3V through CR1, 2 and 3.

4.2.9.3 POWER SUPPLY BATTERY ASSEMBLY 1A1A4 See Figure 5.9A

4.2.9.4 The Power Supply Battery Assembly, mounted on the Front Panel Assembly supplies to the GSB-900SC memory system an unregulated voltage approximately equal to 10 volts and a regulated voltage equal to 5 volts. Mounted on the assembly are the two batteries that provide power to the memory system when the radio is turned off or primary power is disconnected. The batteries are not rechargeable and should be replaced as soon as possible after the LOW BTRY light on the front panel illuminates. Under normal use, the batteries should last in excess of one year. The batteries and battery holder should be inspected periodically for dirt and corrosion and cleaned if necessary. Insure that battery polarity is correct when replacing batteries in the batery holder. See Figure 3.3 for correct installation.

NOTE

The batteries provide power to the memory system to enable it to retain previously programmed (stored) frequencies. As the batteries weaken, they will eventually lose their ability to retain frequencies stored in the memories when the radio is turned off. The memory system receives power from the radio when turned on and stored frequencies can be preserved by not turning the radio off until the batteries can be replaced.

If the batteries are replaced immediately after the LOW BTRY lamp illuminates, the radio may be turned off to accomplish the replacement. The memory system has sufficient data retention capability to maintain the stored frequencies for one-half hour after the radio has been turned off and the batteries removed. This retention time should be enough to replace the weak batteries with fresh ones without losing the frequencies stored in the memory system.

If new batteries are not immediately available, or cannot be changed for several days after the LOW BTRY indicator lights, the radio should be left on and the batteries changed with the radio on to insure that the stored frequencies are not changed due to very weak batteries.

In the event that the frequencies stored in the memory system are unavoidably erased, they may be reloaded by following the procedure outlined in the Loading Frequencies section of this manual.

4.3. GENERAL

The GSB-900SC Secure Channel Memory System consists of three printed circuit boards: Memory System Mother Board (1A1A5), Band Steering Board (1A1A6), and the Memory Board (1A1A7). The boards are housed in a metal wrap around assembly mounted on the front panel.

4.3.1 MEMORY SYSTEM MOTHER BOARD 1A1A5 See Figure 5.9B

The Memory System Mother Board (1A1A5) provides the interconnection between the Band Steering Board, the Memory Board, the transceiver and the front panel. An additional location labeled Remote is provided for future applications. Edge connectors allow the boards to be unplugged from the Mother Board.

4.3.2 BAND STEERING BOARD 1A1A6 See Figure 5.9C

4.3.2.1 GENERAL

The Band Steering Board, by using digital logic circuitry, automatically selects the correct band filter in the Filter Module (1A5) by controlling the DC Band Tuning Motor. It also provides the frequency steering voltages to the Synthesizer. The circuitry to switch the memories from battery power to transceiver 5 volt power (Power Discriminator), and the sensing circuit to indicate low battery voltage are located on this board. Disable and display flashing for frequencies less than 1.6 MHz, and selection of operating modes (Normal, Secure, etc.) are provided by a Mode Discriminator circuit. The Master Clear logic to erase all information stored in the Memories, and the transmit and receive frequency memory location circuitry are located on this board.

4.3.2.2 BAND CONVERTER

Selection of the correct band is accomplished by the Band steering Programmable Read Only Memory (PROM) U21 in which is stored the correct band output for each frequency input combination. Binary addressing of the PROM from the Memory Board 1 MHz and 10 MHz display signals causes one output at a time to go to a high state as a function of what input frequency is selected. Any PROM output which is high, in conjunction with the Load Frequency input to U20D being high (Load Freq mode is not selected), causes U9 through U12 to switch one of transistors Q2 through Q9 on, depending on the frequency band selected by the PROM address. This in turn activates the DC band motor located on Motor Control Board 1A5A4 to select the correct band filter. This holds true for Bands 1 through 7. Band 8 is a switch selected band and does not utilize the PROM for band selection. Selecting a 20 MHz frequency produces a high at board input 1A1A6P2-29 and at Inverter in-

5024011627A

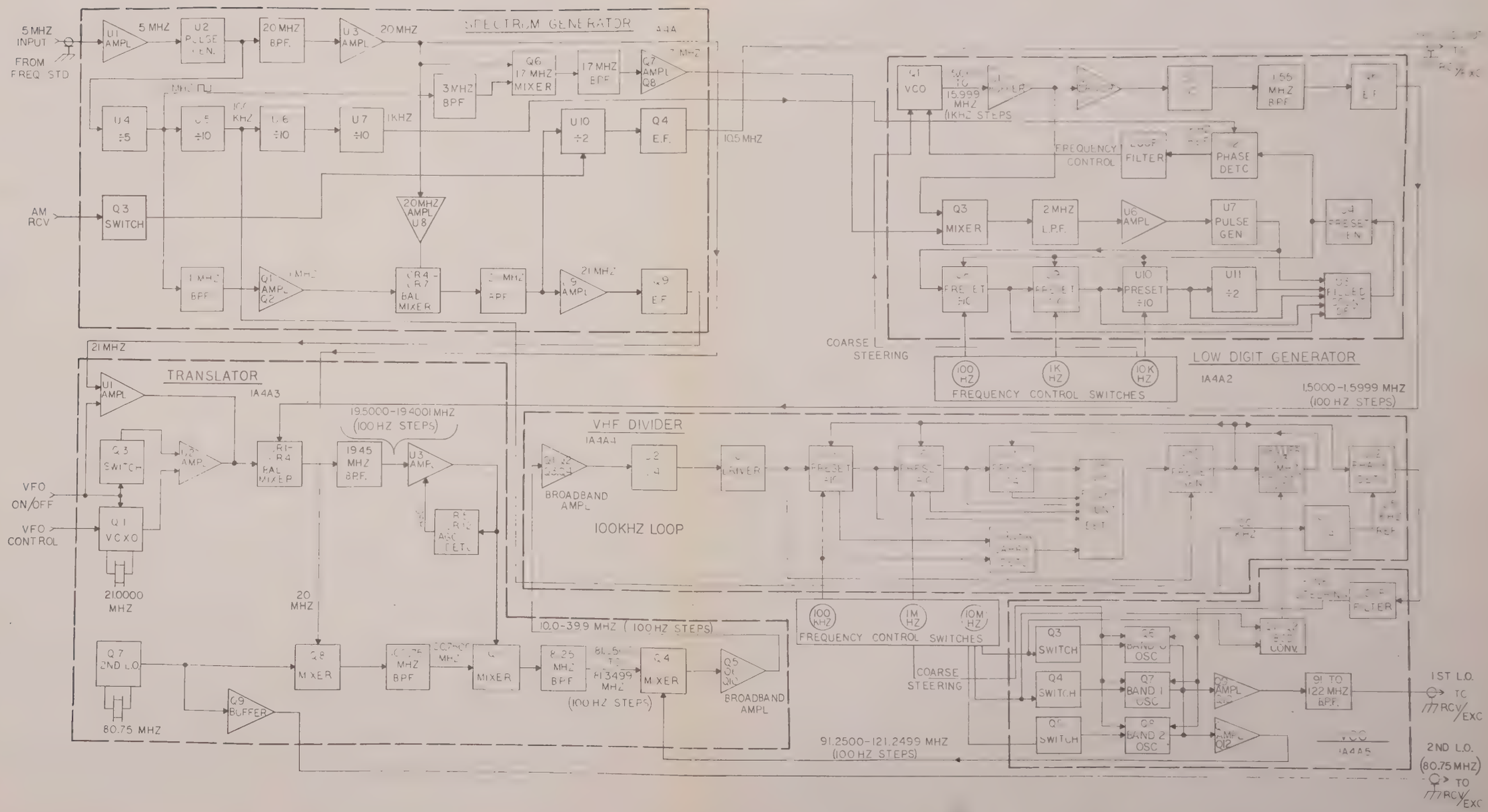


Figure 4.3 Synthesizer Block Diagram and Details

put pin 13 of U7F. The signal being high at pin 13 of U7F enables the Band 8 output at Driver U9 pin 1, while the resulting low at the inverter output, pin 12 of U7F, disables Band 1 through 7 outputs. If the Load Freq input is ever low, which it will be when the Load Freq mode is selected via the Frequency Control Mode keyswitch, the resulting lows at U9, pin 2 and U20D, pin 11 will disable all Band outputs.

4.3.2.3 VHF VCO STEERING

The VHF VCO voltages presented to the Synthesizer are derived by digital to analog (D/A) conversion. This is accomplished by a Binary-Coded-Decimal (BCD) to Decimal decoder, U29. The four binary address inputs which are the four 1 MHz signals produced on the Memory board select 1 of 10 outputs and take it to a Low or On state. The outputs are connected to the bases of PNP transistors. When the base is taken low, the transistor conducts allowing the 12 volt supply voltage connected to the emmiter to be divided between the collector precision resistor and a fixed 15 K ohm 1% resistor (R84) to ground. As different frequencies are selected, the decoder turns on different transistors, each having a different value of emitter resistor. These voltages are fed through an operational amplifier, which is configured as a voltage follower, to the voltage controlled oscillator 1A4A5 in the Synthesizer Module to provide the frequency steering voltages. Low Digit Coarse Steering voltages for the Synthesizer are derived in the same manner by BCD to Decimal decoder U28 and its associated transistors and resistor divider networks. The Low Digit Coarse Steering signal produced at Band Steering output 1A1A6P1-6 is sent to the Synthesizer Low Digit Generator board 1A4A2.

4.3.2.4 POWER DISCRIMINATOR

The Power Discriminator is an electronic switching system that provides the method of changing the Memory System power supply from battery to transceiver power.

When the transceiver power switch is in the Off position, battery power is used to maintain the status of frequencies stored in the memories. Unreg Voltage is supplied to board input 1A1A6P2-73 and the gate of Q15 from the Power Supply Battery Assy 1A1A4. As no voltage appears at the gate of JFET Q15 when the radio is turned off, a low resistance path through the source-drain junction of Q15 and forward biased junction of diode CR7 allows battery power to be applied via output 1A1A6P2-22 to the six Random Access Memories (RAM) on the Memory board to provide data retention. When the radio power switch is turned on, the gate of Q15 is biased positive through diode CR12 turning the transistor off and thereby providing a high resistance path from the batteries to the memories. As this happens, memory power is supplied by the radio +5 volt system through diode CR8.

4.3.2.5 LOW BATTERY INDICATOR

The GSB-900 Secure Channel transceiver features circuitry to sense and indicate when the battery voltage decreases to a level that is insufficient to maintain retention of frequencies stored in the memory system. When the radio is turned on, the Power Clear signal which is initially low becomes high after a time sufficiently long to permit power up transients to die out. Approximately half a second after power up the Power Clear signal goes high. The Power Clear signal on flip-flop U4A pin 3 being low forces the flip-flop to turn on in the reset mode. When Power Clear goes high on pin 3 of U4A, the flip-flop is enabled to set at any time when a positive pulse on pin 1 of U4A occurs while pin 4 of U4A is high. When the Power Clear signal becomes high, pin 10 of inverter U14E and Pin 12 of inverter U14F become low. Approximately 50us later, due to the time-

constant circuit R45, C18, and CR4, pin 1 of inverter U25A becomes low and pin 2 of U25A becomes high. This instantaneous positive going transition at the + side of capacitor C2 causes a corresponding positive going voltage spike at U2C pin 5 which lasts until the capacitor C2 charges through resistor, R4. The positive pulse is squared and inverted by U2C. It is reinverted by U7C into a positive pulse again before being applied to pin 1 of the J-K flip-flop U4A. The trailing edge of the positive pulse will set flip-flop U4A if the battery voltage is low.

At the time when the $\overline{\text{Power Clear}}$ signal goes high the output of inverter U14F which is pin 12 goes low. The time-constant of R46, C19, and CR5 is much longer (200us) than R45, C18, and CR4 (50us), and as C19 discharges, it causes pin 13 of U25F to go low gradually and pin 12 to go high as the switching threshold of the inverter is reached. This causes pin 3 of inverter U7B to go high. Pin 4 of U7B which was high since the radio was turned on now goes low as a result of U7B, pin 3 going high. Due to the time-constant networks, pin 4 of U7B is high from the time the radio is turned on until the $\overline{\text{Power Clear}}$ signal goes high and for 200usec thereafter. This signal produces two conditions. It establishes a high level on pin 10 of AND gate U15C for 200us after the $\overline{\text{Power Clear}}$ goes high and also produces a high level on pin 4 of U15B for the same period. Since pin 5 of U15B goes high when the $\overline{\text{Power Clear}}$ signal goes high, it allows pin 6 of U15B to go high turning on MOSFET Q14 for 200usec only, immediately after $\overline{\text{Power Clear}}$ goes high. This allows the battery voltage to be applied to the V-input of Voltage Comparator U6B for 200usec. If the battery voltage is less than 3 volts, pin 2 of U6B will become positive causing a high level on pin 9 of U15C. Pin 10 of U15C will be high for the same 200 usec so a high level is produced at pin 8 of U15C and pin 4 of U4A. The positive pulse occurs on pin 1 of U4A during the 200usec that pin 4 of U4A is high. This will cause Q output, pin 14, to go low, turning on U1A and lighting the Low Battery Indicator lamp. If the battery voltage is above 3 volts, the Voltage Comparator output will remain low during the battery voltage sampling process. Therefore, pin 4 of U4A will be low during the positive pulse on pin 1 of U4A thus preventing the flip-flop from setting. Consequently, if the flip-flop does not set, the Low battery Lamp will remain off.

4.3.2.6 DISABLE

The transceiver is disabled whenever the selected frequency is less than 1.6 MHz and/or the Frequency Control Mode keyswitch is in the Load Freq position. A selected frequency of less than 1.6 MHz will also cause the display to flash on and off at a rate of approximately once a second.

If a frequency of less than 1.0 MHz is selected, the Band PROM address of 1A1A6P2, pins 17, 21, 23, 25 and 27 will enable PROM output B7, which is U21, pin 9, causing it to reach a high state (Low Frequency). This level appears at pin 10 and pin 8 of OR gate U19C and pin 4 of NAND gate U3B. At pin 5 of U3B, a high level is present from inverter U7F pin 12 due to the 20 MHz switch position not being selected. This causes pin 6 of U3B and pin 6 of U8B to be low enabling the Display Flashing Oscillator. The $\overline{\text{Load Freq}}$ input line is high due to the Mode switch not being in the Load Freq mode. This produces a high at Pin 7 of U8B. Pin 6 of U8B is low forcing pin 5 of U8B low and enabling Q1 to switch on thereby disabling the transceiver via output 1A1A6P2-51 which connects to the Synthesizer Sideband Generator Board 1A3A3 and the Synthesizer Audio Board 1A3A4.

If a frequency between 1.0 MHz and 1.6 MHz is selected the Band PROM address will detect 1 MHz and enable output U21, pin 1,

which will be high. The "600 kHz or greater detector" comprised of AND gate U20B and OR gate U19D will produce a low output at U19D, pin 11. Since AND gate U20C sees a high on input pin 9 but a low on input pin 10, its output pin 8 will be low. This will cause U7E, pin 11, to be low and U7E, pin 10 to be high. The resulting high on U15D, pin 12, coupled with the high on U15D, pin 13, will cause the output of AND gate U15D to be high resulting in a high on pin 9 of U19C. Since U19C is an OR gate with one input, pin 9, high, the output of U19C, pin 8, will be high, as will be the input pin 4 of NAND gate U3B. Since 20 MHz is not enabled the input to U7F, pin 13, will be low causing its output U7F, pin 12, to be high along with U3B, pin 5. Since both inputs to NAND gate U3B are high its output pin 6 will be low enabling the Display Flashing Oscillator as well as turning on the output of U8B, pin 5. With the output transistor of Driver U8B pin 5 on, the transistor Q1 will be on applying 12 volts to the Disable line and disabling the transceiver via board output 1A1A6P2-51.

If the Frequency Control Mode keyswitch is in the Load Freq position the signal, $\overline{\text{Load Freq}}$, will be low driving pin 7 of U8B low and turning on output pin 5 of U8B. With output pin 5 of U8B low or on, transistor Q1 will conduct applying 12 volts to the Disable line and disabling the transceiver.

4.3.2.7 DISPLAY FLASHING

The low level that appears at pin 6 of U3B when a frequency of less than 1.6 MHz is selected also appears at pin 11 and 12 of NAND gate U24D, being utilized as an inverter, causing its open collector transistor output, pin 13, to be off. This ungrounds C8 permitting C8 to charge through R13 and R3. C8 applies its charging voltage to pin 6, the V- input of Voltage Comparator U6A. When this voltage rises to approximately 3.3 volts, it becomes more positive than the V+ input, pin 7, which is at 3.3 volts due to the high on output pin 1 of U6A applied through the resistor divider network R14, R50 and R51. This causes the output, pin 1, to switch low applying a reference voltage of 1.6 volts to pin 7 of U6A through resistor network R14, R50 and R51. The capacitor then begins to discharge through R13 to a value of 1.6 volts. The output switches high and the process repeats itself. This produces an alternating signal at pin 6 of U1B. Pin 7 of U1B is held high by the $\overline{\text{Secure}}$ input since the transceiver is not in the Secure mode of operation. When pin 6 toggles high and low, the output, pin 5 switches off and on respectively causing the display to flash off and on at a rate of approximately once a second. If the Frequency Mode Keylock Switch is in the Secure position, input 7 of Driver U1B will be low turning on the output pin 5 of U1B which continuously keeps the display blanked.

4.3.2.8 MASTER CLEAR

The Master Clear feature of the GSB-900SC enables the erasure of all frequencies stored in the memory system. This is accomplished by "writing" all zeros in the six Random Access Memories that provide memory storage.

With the Mode switch in the Load Freq position, pin 9 of J-K Flip-Flop U4B is high and pin 12 is low. Pin 8 is high. When the Master Clear pushbutton is pressed and released, a positive clock pulse is applied to U4B, pin 6, by the latch formed by Inverters U26E and U26F. At this time several signal levels change state: the $\overline{\text{Q}}$ output of U4B, pin 10 goes low enabling the outputs of memory address bus driver U23 making it ready to pass input data to its outputs; the Clear Mode line goes low through OR gate U19B; the Local Clear Mode line, the Clear Mode line, pin 3 of U24A and pin 5 of U24B are preset to a high level; and pin 1 of U8A goes high causing its output, pin 3 to turn off removing the ground from C11.

When U8A pin 3 goes high, capacitor C11 begins to charge through R10 and R20. This voltage is applied to Pin 8, the V-input of voltage comparator U6D. When the voltage rises to approximately 3.3 volts, it becomes more positive than the V+ input, pin 9, which is at 3.3 volts due to the high on output pin 14 of U6D applied through the voltage divider network R17, R18 and R19. This causes the output of the comparator, pin 14, to switch low and begin discharging C11 through R20 to a point where pin 8 becomes less positive than pin 9, or at about 1.6 volts. The output then switches high again and the oscillatory process repeats itself producing a square wave at the output of the comparator. This square wave is applied to pins 12 and 13 of NAND gate U5D, being used as an inverter, and appears inverted at pin 11 of U5D and pin 8, the Clock input of Decade Counter U22.

The Clock input pin 8 of Decade Counter U22 is initially low as the flip-flop U4B is set when the Clear Mode is initiated. Since U22 pin 8 is low U5B pin 5 will be low which will cause the output of Nand gate U5B pin 6 to be high. Consequently, since all inputs to multi-input Nand gate U17 are high its output will be low thus enabling the Receive Memory Location of Channel 00. Channel 00 is selected because outputs 5, 9, 2 and 12 are low at Decade Counters U22 and U13. This produces lows at the Memory Address Bus via U23 pins 3, 5, 7, 9, 11 and 13 as well as pins 1 and 4 of U24A and U24B. Since the Clear Mode continuously enables zeros at the data inputs of the six Random Acess Memories on the Memory board used to store frequencies and since the Write command is continuously applied to the memories in the Clear Mode, the Receive Location of Channel 00 will have a zero frequency stored in it. As the clock input to pin 8 of U22 goes high the first time, it will have no influence on the input pin 8 of U22 since U22 clocks only on negative transitions. However, the high at pin 8 of U22 will produce a high at U5B pin 5 which when coupled with the high on Nand input pin 4 of U5B will produce a low out of pin 6 of U5B. This low will produce a low on input pin 3 of Nand gate U17. Any low input to a Nand gate will produce a high output. Consequently the output of U17 pin 8 will become high, thus selecting the Transmit Location of Channel 00 which is immediately loaded with zeros. The first time the clock makes a high to low transition on pin 8 of Counter U22, the counter will increment producing a high at output pin 5 which selects Channel 01. Since the clock signal is low, U17 pin 8 will be low selecting the Receive Location of Channel 01 for entering of zeros. As the clock continues to oscillate, it alternately selects Transmit and Receive Locations of each channel from 00 through 09. These locations in the memory are each filled with zeros as they are addressed by Counter U22 and Nand gate U17. When Counter U22 fills to capacity, which is after nine clock pulses, its output, pin 12, will be high after going high on the eighth clock pulse. On the tenth clock pulse, Counter U22 will overflow to zero again, which will cause output pin 12 to go low. This negative going transition will clock Counter U13 to one. The result will be the selection of the Receive Location of Channel 10 which is filled with zeros. Each time Counter U22 is filled and overflows, Counter U13 will be incremented one count. This continues until both the Receive and Transmit Locations of every Channel from 00 through 99 are selecd by the oscillating clock frequency through Counters U22 and U13 and Nand gate U17. Finally, after the Clock into pin 8 of U22 is high for the hundredth time, it will go low for the final time during this particular example of a Clear Mode sequence. When it does, output pin 12 of Counter U13 will go low after going high for the first time when Channel 80 was addressed.

When U13, pin 12, goes low, applying this level to pin 3 of inverter U2B, the output of U2B, pin 4, goes high. This high going trans-

ition produces a positive voltage spike at U2A, pin 1, which lasts until capacitor C4 charges from the output of U2B which is pin 4. The positive pulse at pin 1 of Inverter U2A applies a negative Clear pulse to pin 8 of U4B. This makes the flip-flop Q output, pin 11, go low, allowing U8A pin 3 to go low stopping the voltage comparator-clock U6D and thereby halting the count sequence. Also, the $\overline{Q}$ output, pin 10 of U4B, goes high disabling the memory address bus driver, U23. At the same time pins 3 and 5 of Nand gates U24A and U24B respectively, go low, which disables outputs 1 and 4 entitled Bus 80 and Bus 40 to the Memory Board.

4.3.2.9 KEYLINE

The Keyline is operated from the 12 volt supply and therefore must be transformed into a 5 volt level to be compatible with the digital logic used in the transceiver control circuitry. This is accomplished by a voltage comparator, U6C, and its associated components. When the Keyline is brought low at 1A1A6P1-5, the V-input, pin 10, of the Voltage Comparator becomes less positive than the V+ input, pin 11. The V+ input, pin 11, is biased above ground to 2.5 volts by the resistor divider network R21, R52 and R53. When the Keyline goes low, the comparator output switches to a 5 volt level through R22. At this time, the V+ input is pulled higher through R21, reinforcing the output switching. This output level is applied to Nand gate U5A, pin 2. Pin 1 of U5A should also be high because the Load Frequency Mode is not selected in this example. Consequently with two high inputs, the output of U5A, pin 3, should be low. The outputs of U3C, U3D, U5B and U5C will be high since at least one input to each of those Nand gates is low at this time. Since only one input which is pin 3 of U17 is low, the output of U17, which is pin 8, will be high, enabling the Transmit Memory location and transmitting the frequency stored in that location. Also, through Inverter U7D and Driver U18, this high level switches the RCV lamp off and the XMT lamp on, indicating that the transmitter is keyed.

4.3.3.1 LOAD XMT PUSHBUTTON

With the Frequency Control Mode Keyswitch in the Load Freq position, when the Load XMT pushbutton is depressed, the output of the latch comprised of inverters U26C and U26D goes to a high state applying a positive pulse to pin 10 of NAND gates U3C and pin 13 of U3D. Also, when the latch goes high, a positive going spike is applied to pin 3 of AND-OR-INVERT gate U16. Pin 2 of U16 is high at the same time since the Load Freq mode is selected. At least one input of each of the other input pairs to U16 is low. Consequently, as pin 3 of U17 pulses high, pin 8, goes low, enabling the memory Read/$\overline{\text{Write}}$ line low and storing the selected frequency in memory. As this is happening, the signal that is present at U3C and D causes output pin 8 and 11 respectively to go low depending on whether the Load Freq or the Read Freq mode is selected. At least one input to U5A, B and C is also low, so a high appears at each of their outputs. With all inputs high at U17 except either pin 1 or 12 which goes low, the output of NAND gate U17, pin 8, goes high causing the XMT memory location line to become high and assigning the frequency a selected channel transmit location. As C20 charges, the positive pulse at U16, pin 3, becomes low, causing the output, pin 8, to become high, disabling the Memory Write function. When the Load XMT pushbutton is released, the latch resets to a low state. This causes U17, pin 8, to go low, resetting the XMT/$\overline{\text{RCV}}$ memory location line so that the Receive location is enabled.

4.3.3.2 LOAD RCV PUSHBUTTON

With the Frequency Control Mode Keyswitch in the Load Freq position, the XMT/$\overline{\text{RCV}}$

memory location line is low due to the Load XMT pushbutton latch presenting a low level to NAND gates U3C and U3D. The XMT/RCV memory location line must be low to enter a selected Receive channel frequency. When the Load RCV pushbutton is depressed, the output of the latch, comprised of inverters U26A and U26B, becomes high. This level is applied to an AND-OR-INVERT gate U16, pin 1. Pin 13 of U16 is high at the same time since the Load Freq mode is selected. At least one input of each of the other input pairs to U16 is low. Consequently as pin 1 of U16 goes high, a low level appears at the output, pin 8. This enables the memory Read/$\overline{\text{Write}}$ line to go low, allowing the selected frequency to be written (stored) in the channel selected by the Channel Selector switches on the Front Panel. When the Load RCV pushbutton is released, the latch output returns to a low level and causes the Read/Write line to go high and end the Write cycle.

4.3.4 MEMORY BOARD 1A1A7
See Figure 5.9D

4.3.4.1 GENERAL

The Memory printed circuit board, 1A1A7, contains the circuitry that stores the frequencies programmed by the Front Panel Frequency Selector switches. It also provides the method of by-passing the memory elements when the Frequency Control Mode Keyswitch is in the Normal position, thereby allowing direct selection of operating frequencies from the Frequency Selector switches on the front panel. The converters that are necessary to provide the correct programming information for the synthesizer are contained on this board. Also, the circuitry that allows the memories to be disabled to conserve power drawn from the batteries when the radio is off is located on this board. The Random Access Memories (RAMs) that are the frequency storage elements, are Complementary Metal-Oxide Semiconductors (CMOS) devices that operate with very low power consumption and high reliability. Due to the low standby power required (60uA total) by the RAMS, the life expectancy of the batteries is in excess of one year if the radio is never turned on during that year, and at least 3 years if the radio is frequently used. The batteries are only used to retain stored frequencies when the radio is turned off since an electronic switching circuit selects the transceiver 5 volt power source and disconnects the batteries when the radio is turned on.

Within the RAMS, U3 through U8, on the Memory Board 100 channels of storage are available, with each channel capable of storing one transmit and one receive frequency. Each RAM stores one digit of any stored frequency. RAM U8 always stores the 10 MHz digit. RAM U7 stores the 1 MHz digit of every frequency. RAMS U6 through U3 store the 100 kHz digit through the 100 Hz digit respectively. Data is entered, or "written", into the RAMS during the following input conditions: Chip Enable 1 low ($\overline{CE_1}$), Chip Enable 2 (CE_2) high, output disable (O.D.) high, and the Read/$\overline{\text{Write}}$ ($R/\overline{W}$) input low. The data entered on the data inputs, pins 9, 11, 13 and 15 of any RAM, can be high or low (a one or a zero). During the Write operation, the outputs are in the high-impedance, or off state, because the Output Disable input pin 18 of each RAM will be high. Pin 18, the Output Disable input, is driven from Memory Board input 1A1A7P1-57 called $\overline{\text{Read Freq + Secure}}$. This signal, $\overline{\text{Read Freq + Secure}}$, is high anytime either the Read Freq or the Secure mode is not selected which is anytime the radio operates in the Normal or the Load Freq mode. Therefore, the output of the RAMS U3-U8 are disabled in the Normal or the Load Freq mode since pin 18 of each RAM is high at that time.

Information is entered into the RAMS, U3-U8, by the six Frequency Selector switches according to the addressing provided by the two

Channel Selector switches. The Binary Coded Decimal (BCD) information presented by the Channel Selector switches is converted to Binary data by the two BCD to Binary Converters U1 and U2. The outputs of the converters select the RAM addresses A2 through A7. RAM address A1 is selected directly from the least significant bit of the Channel Selector Units switch at Memory Board input 1A1A7P1-60 since that input is the same in BCD or Binary. A0 is used to define a Receive or Transmit frequency location when the Load RCV and Load XMT pushbuttons are pressed. This XMT/$\overline{\text{RCV}}$ signal, found on input 1A1A7P1-15 of the Memory Board, selects either of two locations in memory for each of the 100 channels available for frequency storage. Consequently, a total of 200 memory locations are available if all 100 (00 to 99) channels are programmed.

The six Frequency Selector switches program BCD data into the RAM data inputs. The Memories can also be by-passed allowing the Frequency Selector switches to be used to program the synthesizer and displays directly by selecting the Normal position of the Frequency Control Mode Keyswitch.

To read data out of the RAMS after it has been stored, the Read/$\overline{\text{Write}}$ input of 1A1A7P1-19 to the Memory Board must be high thus providing a high on input pin 20 of each RAM, U3-U8. The Read/$\overline{\text{Write}}$ input is generated on the Band Steering Board, 1A1A6. Also the Output Disable input, pin 18, of each RAM must be low as a result of a low on the Memory Board input 1A1A7P1-57 which is called $\overline{\text{Read Freq + Secure}}$. The signal $\overline{\text{Read Freq + Secure}}$ will be low anytime either the Read Freq mode or the Secure mode is selected. With the Output Disable input low on pin 18 of each RAM, the data outputs of each RAM will be enabled so that they can program the display and the synthesizer. Each data output will be either a one or a zero depending on whether a one or a zero was stored in the RAM initially.

Figure 4.4 shows a simplified block diagram of the memory system. Portions of the system are enabled or disabled at certain times depending on the mode selected by the Frequency Control Mode Keyswitch.

4.3.4.2 FREQUENCY SELECTOR SWITCH INTERFACE DRIVERS (DRIVERS #1)

The Frequency Selector Switch Interface Drivers are designated as Drivers #1 in Fig. 4.4 which is a block diagram of the Memory Board 1A1A7. The Frequency Selector Switch Interface Drivers are comprised of Hex Bus Drivers U23, U24, U25 and U26A. These Drivers pass the BCD Frequency Selector Switch information into the Memory Board except when their outputs are forced into a high impedance state by the presence of a high on the Clear Mode input pin 15 of U23, U24, U25 and U26A. Consequently the BCD Frequency Selector Switch information is always passed into the Memory Board for processing except when the Clear Mode signal indicates that the Master Clear button has been pushed and that zeros are being loaded into all the memory locations. In that case the BCD Frequency Switch information is blocked from entering the Memory Board because the Band Steering Board, 1A1A6, is producing a high on Memory Board input 1A1A7P1-63 called Clear Mode which disables Drivers #1 and prevents any influence by the Frequency Switch information.

4.2.4.3 MEMORY ERASE INPUT DRIVERS (DRIVERS #2)

The Memory Erase Input Drivers are designated as Drivers #2 in Fig. 4.4 , the Memory Board block diagram. The Memory Erase Input Drivers are comprised of Hex Bus Drivers U11, U12, U13 and U14. These Drivers produce high impedance outputs continuously

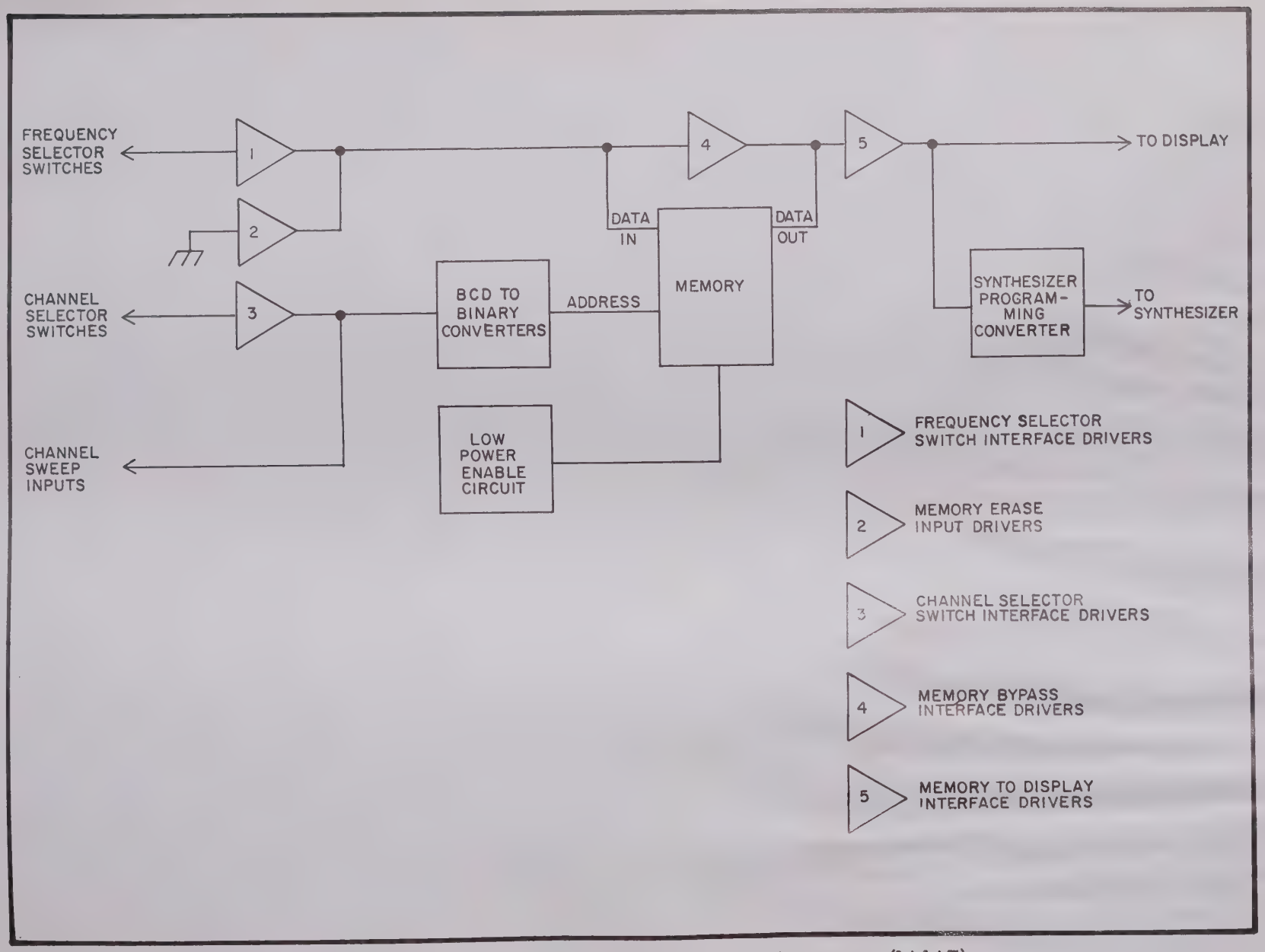


Figure 4.4 GSB-900SC Memory Board Block Diagram (1A1A7)

except when they are enabled by a low on the Clear Mode line on input 1 of U11, U12, U13 and U14. The Clear Mode input, which is low whenever the Master Clear button has been pressed in the Load Freq mode, will produce a low on the Band Steering Board, 1A1A6, which will pull input 1A1A7P1-3 low on the Memory Board. When this signal is low Drivers #2 are enabled such that their grounded inputs pass zeros through to their outputs and produce lows on all the Memory Data Inputs to load zeros in all memory locations. At the same time, the front panel Frequency Switches would be prevented from influencing the Memory Data Inputs because Drivers #1 would be disabled.

4.3.4.4 CHANNEL SELECTOR SWITCH INTERFACE DRIVERS (DRIVERS #3)

The Channel Selector Switch Interface Drivers are designated as Drivers #3 in Fig. 4.4 The Channel Selector Switch Interface Drivers includes Hex Bus Drivers U22 and U26B. These drivers pass the Channel Selector Switch information into the Memory Board at the same time the Frequency Selector Switch Interface Drivers pass the Frequency Switch information into the Memory Board. This is because Drivers #3, comprised of U22 and U26B, are enabled by a low on the Clear Mode input pin 15 of U22 and U26A. However, just as with Drivers #1, when the Clear Mode input on 1A1A7P1-63 of the Memory Board is high, the outputs of Drivers #3 become high impedance preventing the Channel Selector Switches from influencing the Memory Addressing Inputs. This action permits the Channel Sweep Inputs seen in Fig. 4.4 to control the Memory Addressing Inputs so that each memory address may be selected in sequence to facilitate the loading of zeros in all memory locations during the Clear Mode.

4.3.4.5 MEMORY BYPASS INTERFACE DRIVERS (DRIVERS #4)

The Memory Bypass Interface Drivers are designated as Drivers #4 in Fig. 4.4. The Memory Bypass Interface Drivers are comprised of Hex Bus Drivers U15, U16, U17 and U18. If inputs 1 and 15 of U15, U16, U17 and U18 are low, the Memory Bypass Interface Drivers will permit the BCD information simultaneously present both on their inputs and on the Memory Data Inputs to bypass the Memory RAMS, U3 through U8. The outputs of Drivers #4 will appear as outputs on the Memory Data Output lines even though they do not originate within the memories. Inputs 1 and 15 of U15 through U18 are called Read Freq and Secure, respectively. They originate on the Band Steering Board, 1A1A6, and enter the Memory Board at 1A1A7P2-75 and 1A1A7P2-77, respectively. Both signals will be low permitting the Memory RAMS to be bypassed if neither the Read Freq mode nor the Secure mode are selected via the front panel Frequency Mode Keylock switch, S9. If the radio is operating in either the Read Freq or the secure mode, Drivers #4 will be disabled and the contents of the Memory RAMS, U3-U8, will instead be present on the Memory Data Output lines. If the radio is operating in either the Read Freq or the Secure mode, then either inputs 1 or 15 of Drivers U15 through U18 will be high thus causing their outputs to become high impedance. Since the RAM Memory Data Outputs are enabled only during the Read Freq or the Secure Mode and are high impedance during the Normal or the Load Freq mode, the Memory Data Output lines will contain the BCD Frequency switch input data during the Normal and the Load Freq mode and the BCD Memory contents during the Read Freq or the Secure mode.

4.3.4.6 MEMORY DISPLAY INTERFACE DRIVERS (DRIVERS #5)

The Memory to Display Interface Drivers are designated as Drivers #5 in Fig. 4.4. The Memory to Display Interface Drivers are comprised of Hex Buffer/Drivers U27,

U28, U29 and U30. These drivers are always enabled. They provide output drive capability for whatever BCD data is found on the Memory Data Output lines. They send the BCD data on the Memory Data Output lines, whether it represents the Frequency Switch inputs or the contents of Memory, to the Display Driver Board, 1A1A2. The Memory to Display Interface Drivers send the 10 MHz, 1 MHz, 100 kHz and 10 kHz Memory Board output data to the Band Steering Board, 1A1A6, where it drives the two Synthesizer Steering Networks as well as the Band Converter Circuits. On the Memory Board itself, the 10 MHz, 1 MHz and 100 kHz BCD outputs of the Memory to Display Interface Drivers provide control inputs to the Synthesizer Programming Converter seen in Fig. 4.4. The Synthesizer Programming Converter changes the 10 MHz, 1 MHz and 100 kHz BCD output data of the Memory to Display Interface Drivers to Inverted Decimal, Nines Complement and Tens Complement data for the 10 MHz, 1 MHz and 100 kHz Synthesizer inputs, respectively.

4.3.4.7 SYNTHESIZER PROGRAMMING CONVERTER

The Synthesizer Programming Converter in Fig.4.4 changes the 10 MHz, 1 MHz and 100 kHz BCD output data of the Memory to Display Intertace Drivers to Inverted Decimal, Nines complement and Tens Complement data for the 10 MHz, 1 MHz and 100 kHz Synthesizer inputs, respectively. The 10 MHz Synthesizer Programming Converter is comprised of Hex Buffer Drivers U21A, U21B and U21C as well as Nor Gate U20D. The 10 MHz Synthesizer Programming Converter changes the 10 MHz BCD information found in the Memory System to 10 MHz Inverted Decimal Information required by the Synthesizer 10 MHz input. Table 4.1 describes this conversion.

Note in Table 4.1 that pin 3 of U21B and pin 5 of U21C carry BCD information while pin 4 of U21B, pin 6 of U21C and pin 2 of U21A display Inverted Decimal outputs. The signal levels on pins 2, 4 and 6 of U21A, U21B and U21C, respectively, will measure approximately 12 volts in a radio when a Logical 1 is indicated. They will measure between zero and 0.4 volts when a Logical 0 is indicated. All other signal levels in Table 4.1 are TTL compatible logic levels.

NOTE

The TTL compatible logic levels are as follows:

Logical 0 = greater than 0.0 volts but less than 0.8 volts.

Logical 1 = greater than 2.0 volts but less than 5.0 volts.

10 MHz Display	U21B-3	U21C-5	U20D-13	U21B-4	U21C-6	U21A-2
0	0	0	1	1	1	0
1	0	1	0	1	0	1
2	1	0	0	0	1	1

Table 4.1, 10 MHz Synthesizer Programming Converter

4.3.4.8 The 1 MHz Synthesizer Programming Converter is comprised of Schmitt Triggers U19A, U19B, U19C and U19D as well as Binary Adder U31. It changes the 1 MHz BCD information found in the Memory System to 1 MHz Nines Complement information required by the Synthesizer 1 MHz input. Table 4.2 describes this conversion. In Table 4.2 all signal levels are TTL compatible logic levels.

4.3.4.9 The 100 kHz Synthesizer Programming Converter includes Hex Buffer Driver Inverters U21D and U21E, Nor Gates U20A and U20B, Nand Gate U9A and Binary Adder U32. It changes the 100 kHz BCD information found in the Memory System to 100 kHz Tens Complement Information required by the Synthesizer 100 kHz input. Table 4.3 describes this conversion. All signal levels are TTL compatible Logical 1's and Logical 0's.

4.3.5.1 The Synthesizer 10 kHz, 1 kHz and 100 Hz inputs require BCD information which is provided by the outputs of Drivers U27, U28, U29A and U29B. These Driver outputs also control the 10 kHz, 1 kHz and 100 Hz displays.

4.3.5.2 Referring again to Fig, 4.4 , the Memory Board Block Diagram, note that portions of the system are enabled or disabled at certain times depending on the mode

	BCD				Inverted BCD				Nines Complement			
1 MHz Display	U19A Pin 1	U19B Pin 3	U19C Pin 5	U19D Pin 9	U19A Pin 2	U19B Pin 4	U19C Pin 6	U19D Pin 8	U31 Pin 10	U31 Pin 13	U31 Pin 1	U31 Pin 4
0	0	0	0	0	1	1	1	1	1	0	0	1
1	0	0	0	1	1	1	1	0	1	0	0	0
2	0	0	1	0	1	1	0	1	0	1	1	1
3	0	0	1	1	1	1	0	0	0	1	1	0
4	0	1	0	0	1	0	1	1	0	1	0	1
5	0	1	0	1	1	0	1	0	0	1	0	0
6	0	1	1	0	1	0	0	1	0	0	1	1
7	0	1	1	1	1	0	0	0	0	0	1	0
8	1	0	0	0	0	1	1	1	0	0	0	1
9	1	0	0	1	0	1	1	0	0	0	0	0

Table 4.2 1 MHz Synthesizer Programming Converter

selected by the Frequency Control Mode Key switch. The numbered drivers in Fig. 4.4. will define the paths of signals in the following mode descriptions.

4.3.5.3 NORMAL MODE

With the Keyswitch in the Normal position, Drivers #1, #4 and #5 are enabled. This allows data from the Frequency Selector switches to control the synthesizer and the displays. The Read Freq + Secure line is high, so the memory output disable (O.D.) input is high, placing the memories in the high impedance (disabled) output state. The synthesizer frequency is controlled by the front panel Frequency Selector switches through the Synthesizer Programming Converter.

4.3.5.4 LOAD FREQ MODE

In the Load Freq mode, Drivers #1, #4 and #5 are enabled. The memory outputs are disabled due to the Read Freq + Secure input being high. In the Load Freq mode the radio is disabled. The memory address locations are selected by the Channel selector switches through Drivers #3, which are enabled. The frequencies to be programmed into memory, and the displayed frequencies, are controlled by the front panel Frequency switches. The Load XMT and Load RCV pushbuttons are depressed in turn to exercise the Write memory input line and store the frequency information in memory.

	BCD				Inverted BCD					Tens Complement			
100 kHz Display	U21D Pin 9	U21E Pin 11	U20A Pin 2	U20B Pin 5	U21D Pin 8	U21E Pin 10	U20A Pin 1	U20B Pin 4	U9A Pin 6	U32 Pin 10	U32 Pin 13	U32 Pin 1	U32 Pin 4
0	0	0	0	0	1	1	1	1	0	0	0	0	0
1	0	0	0	1	1	1	1	0	1	1	0	0	1
2	0	0	1	0	1	1	0	1	1	1	0	0	0
3	0	0	1	1	1	1	0	0	1	0	1	1	1
4	0	1	0	0	1	0	1	1	1	0	1	1	0
5	0	1	0	1	1	0	1	0	1	0	1	0	1
6	0	1	1	0	1	0	0	1	1	0	1	0	0
7	0	1	1	1	1	0	0	0	1	0	0	1	1
8	1	0	0	0	0	1	1	1	1	0	0	1	0
9	1	0	0	1	0	1	1	0	1	0	0	0	1

Table 4.3 100 kHz Synthesizer Programming Converter.

4.3.5.5 READ FREQ MODE

In the Read Freq mode, Drivers #3 and #5 are enabled. The frequencies previously programmed into memory are selected by the Channel Selector switches. The synthesizer and the display are controlled by the memory outputs which are enabled due to the Read/ Write memory input being high. The Receive frequency is displayed. When the transceiver is keyed, the Transmit frequency is displayed.

4.3.5.6 SECURE MODE

In Secure mode, Drivers #3 and #5 are enabled in the same manner as in the Read Freq mode. However, since the Secure Signal on the Band Steering Board is low, this forces pin 2 of 1A1A2P2 low, blanking the display with the exception of the decimal point. The Channel Selector switches are operational since Drivers #3 are enabled.

NOTE

All connections labeled REMOTE are physically installed and are intended for a possible future application.

4.3.5.7 LOW POWER ENABLE

The Low Power Enable circuit places the memories in the standby, or low power mode of operation. This is accomplished by bringing the CE2 RAM inputs, which are found on pin 17 of U3B through U8B, to a low state, thereby forcing the outputs of the RAMS to a high impedance state and the RAMS themselves to a low power standby condition. This is done when the transceiver is turned off causing Unregulated voltage at 1A1A7 P1 pin 78 to begin to decay. As the Unregulated voltage decays, the voltage drop across resistor R6 decreases proportionately while the voltage across Zener Diode CR1 remains constant. Eventually, as the Unregulated voltage continues to drop, no voltage drop exists across R6 as the base of Q1 reaches 5 volts while the voltage across CR1 remains constant at approximately 2 volts. Consequently, as the Unregulated voltage drops further, the emitter to base voltage on Q1 starts to decrease until it is no longer great enough to sustain Q1 in the on state. Q1 turns off permitting R1 to apply a ground to the CE2 inputs of the RAMS, thus placing the RAMS in a disabled condition. As the Unregulated voltage decreases beyond this point, the 5 volts starts to follow it to ground until the only voltage on the Memory Board is the Battery Voltage on pin 22 of each RAM. This is because as the Unregulated voltage decreased after the transceiver was turned off, pin 73 of 1A1A6P2 on the Band Steering Board went low, switching Q15 of the Band Steering Board on and allowing battery power to be applied to the Memory Power bus, pin 22 of Memory Board 1A1A7P2. Due to the decay time-constant of the front panel power supply, the CE2 input of each memory RAM is switched low by Q1, turning off the memory RAM's before the Memory Board 5 volts starts to decay.

This timing sequence is necessary to prevent alteration of the information previously programmed in the memory system when the transceiver is turned off.

When the transceiver is turned on, the Unregulated voltage and the 5 volt power supplies start to rise to their normal operating levels. As this occurs, pin 73 of 1A1A6P2 on the Band Steering Board rises and turns off Q15 of the Band Steering Board 1A1A6, disconnecting the battery supply from the memories and permitting the 5 volt transceiver supply voltage to forward bias CR8 of the Band Steering Board and assume support of the memory power on 1A1A7P2-22 of the Memory Board. Simultaneously, the Unregulated voltage at 1A1A7P1-78, and the 5 volt supply at

1A1A7P1-1 rises. The 5 volt supply turns Q1 on as the Unregulated voltage rises high enough with respect to the radio 5 volts to produce a turn on voltage drop from emitter to base of Q1 after the drop across Zener Diode CR1 is satisfied. When Q1 switches on, the Unregulated voltage would be applied to CE2 input of the RAMS through CR1, Q1 and voltage divider R2 and R1. However, this point is held low by buffer U10A until sufficient positive going voltage at U19F pin 13 causes its output to switch low and U19E pin 10 to turn on allowing CE2 to go high, changing the memories from standby to operating mode. This switching sequence is necessary to prevent alteration of information stored in the memories when the transceiver is turned on. The signal at U19E, pin 10, is presented also to the input of Driver U10B. The output of Driver U10B which is pin 4 is the source of the $\overline{\text{PWR CLEAR}}$ signal produced at Board output 1A1A7P1-65. This does not go high for approximately half a second or until the voltage on Schmitt trigger U19F pin 13 becomes high as a result of the slow time constant charge of capacitor C9 through R24. When U19F pin 13 switches high, U19F pin 12 switches low forcing U19E pin 10 to switch high and permitting the output of U10B, pin 4, to switch high after all the radio turn on transients have died out. This $\overline{\text{PWR CLEAR}}$ signal is used to disable certain critical areas of the Memory System until the power up transients decay. Diode CR3 and Resistor R23 are used to rapidly discharge C9 into the 5 volt supply as it decays. This is done so that C9 is quickly discharged and ready to produce the next $\overline{\text{PWR CLEAR}}$ signal in the event the radio is quickly turned on again.

4.4 RECEIVER

The receiver electronics are divided among four printed circuit boards: VHF MIXER (1A3A1), IF/FILTER (1A3A2), AUDIO (1A3A4), and SPEAKER DRIVER (1A1A1). The first three boards are interconnected by plugging into the RECEIVER/EXCITER MOTHER BOARD, (1A3A5). The SPEAKER DRIVER is located on the front panel. The block diagram is shown in figure 4.7.

4.4.1 GENERAL

Received signals are first passed through a band pass filter network in the filter module, then are fed into an 11 pole high pass filter on the VHF mixer board. This filter is a very sharp cut off broadcast band rejection network. The signal is then amplified and mixed in a balanced mixer with the first local oscillator, providing an output on 91.25 MHz.

In addition to 91.25 MHz, the mixer output contains several other significant mixing products, but because of the high frequencies involved they are separated in frequency from 91.25 MHz by a relatively large amount. The unwanted products are removed by passing the mixer output through a narrow band 91.25 MHz crystal filter. The resulting 91.25 MHz signal is then amplified and mixed again in another balanced mixer with the second local oscillator (80.75 MHz), which yields an output at 10.5 MHz. High frequency products from this mixing are removed by a low pass filter.

The 10.5 MHz I.F. signal is amplified, then fed to a diode gating network which selects the upper sideband filter (USB), lower sideband filter (LSB), or amplitude modulation filter (AM). These filters determine the receiver's bandwith and reduce the interference from adjacent channels. The filtered I.F. signal is passed through another diode gate, then is highly amplified in two integrated circuit I.F. amplifiers. The output of the second I.F. amplifier is coupled to a product detector when receiving sideband signals and to a fixed amplifier and an envelope detector for receiving amplitude modulated signals. The fixed amplifier also feeds into the AGC detector which develops a D.C. voltage proportional to the received signal amplitude. The AGC voltage is amplified and used to control the voltage gain of the RF amplifier and the two integrated circuit I.F. amplifiers.

The product detector combines the 2nd I.F. signal with the 3rd local oscillator (10.5 MHz), giving an audio signal which reproduces the original transmitted audio. The audio is fed to a 600 ohm line

driver and to a fixed audio amplifier. The envelope detector detects the amplitude of the received signal reproducing the audio on a transmitted AM signal. The resultant audio is also fed to the 600 ohm line driver and to the fixed audio amplifier.

The output of the fixed audio amplifier is connected to the VOLUME control, then to the speaker driver (located on the front panel), which supplies up to five watts of audio to the speaker.

The AGC voltage also is used to vary the current through the front panel meter to give a visual indication of relative signal strength received.

The front panel RF GAIN control acts to vary the gain of an amplifier which shuts back the AGC voltage, reducing the gain of the RF amplifier and the two integrated circuit I.F. amplifiers. This greatly reduces background noise when receiving strong signals.

The following subparagraphs describe circuit operation of the individual circuits by printed circuit board.

4.4.2 VHF MIXER BOARD –1A3A1

Figure 5.18 consists of a front view (component side) and a rear view (foil side) plus a schematic of the VHF MIXER printed circuit board. In addition a complete parts list is provided on the reverse side of the fold out page.

4.4.2.1 BROADCAST FILTER

The R.F. input signal appears on pin 15 of 1A3A1-P1, and is passed through the broadcast band filter network, starting with C9 and ending at C13, to stepup transformer T1, which matches the R.F. amplifier (Q2) input impedance to the 50 ohm characteristic impedance of the broadcast band filter.

4.4.2.2. RF AMPLIFIER

The R.F. amplifier is a dual gate MOSFET with protection diodes built into the input gate to prevent burnout under overload. The input signal is applied to gate 1 and the amplified signal is taken from the drain through transformer T3. The source (gate 1 through R8) is biased positively by 3.6V to increase the dynamic gain range when Gate 2 voltage is varied. The 40673 transistor can now be practically cut off when gate 2 voltage is taken to zero. Gate 2 derives its voltage from the automatic gain control (AGC) line, which varies between +8V at no signal to approximately +2V for an extremely strong signal.

The output of T3 passes through diode CR3 to the input of balanced mixer transformer T4. Since the +12R voltage is +12V during receive (and ground during transmit) and the +12T voltage is ground during receive (and +12V during transmit), diode CR3 is switched on (conducts) by the voltage on T3, through the winding on T4, and R14 to the +12T line (which is at ground potential). Likewise, diode CR1 is turned off during receive and has no effect on the operation.

4.4.2.3 1st LO AMPLIFIER AND BALANCED MIXER

Local oscillator number 1 is injected at pin 18 of 1A3A1-P1 into amplifier Q5. The amplified L.O. is applied to T5 to switch hot carrier diodes CR4-7 on and off at the L.O. frequency. The injected R.F. signal at T4 now mixes with the L.O. signal to provide several outputs, one of which is 91.25 MHz. The balanced mixer is used to minimize the number of mixing products because of its inherent ability to virtually eliminate the even harmonics of the mixing frequencies and their sums and differences, as well as the mixing frequencies themselves. Therefore, the primary mixer output is L.O. number 1 plus the R.F. signal and L.O. number 1 minus the RF signal. L.O. number 1 frequency is variable between 92.85 MHz and 121.25 MHz, corresponding to 1.6 to 29.999 MHz selected by the front panel frequency dials. In the GSB-900SC the difference frequency is selected and a first I.F. of 91.25 MHz was picked to minimize spurious frequencies within the transceiver. Note that at the lowest frequency of operation, 1.6 MHz, the sum and difference frequencies in the mixer output are 3.2 MHz apart making it a simple task to remove the sum frequency with a narrow band crystal filter.

For instance, if the received signal is on 10.000 MHz, the first L.O. frequency is 101.25 MHz,and

the two mixer output frequencies are 91.25 and 111.25 MHz.

4.4.2.4 VHF FILTER AND BILATERAL AMPLIFIER

The mixer output is taken between the center taps of T4 and T5, fed through a matching network, L10 and C41, into filter FL1 at 91.25 MHz. The filter impedance is approximately 4000 ohms, hence the need for matching from the low impedance mixer output. Another matching network, C44 and L11, match the filter into the 50 ohm input impedance of the bilateral amplifier, Q6 and Q7. The amplifier is bilateral in that it amplifies in both directions, Q6 is active on receive, and Q7 is active on transmit.

Capacitors C46 and C47 form an impedance transformation network with T7 to match the gate 1 impedance of Q6. When Q6 is turned on by +12R on gate 2; Q7 is turned off by the +12T ground on its gate 2 (for explanation see paragraph 4.4.2.2). As with the R.F. amplifier, the source is biased positively by 3.6V to allow gate 2 to turn the device on or off.

The output of amplifier Q6 is taken through impedance matching network T8, C55, and C56 to T9, the input to a second balanced mixer. Note that in the receive mode, T7 is the input transformer and T8 is the output transformer for Q6; while in transmit mode, T8 is the input transformer and T7 is the output transformer for Q7.

4.4.2.5 2ND LO AMPLIFIER AND BALANCED MIXER

The second mixer operates in a manner similar to the first mixer. The main difference is that the first mixer is an "up converter", that is, its output frequency is higher than the input frequency. The second mixer is a "down converter" changing the 91.25 MHz signal to 10.5 MHz. Transistor Q8 amplifies the second local oscillator signal, 80.75 MHz, and feeds it to the mixer through transformer T11. The output of the second mixer is taken from T9 center tap and passes through a low pass filter to eliminate the high frequency mixing products. The output of the VHF mixer board is on pin number 5 of 1A3A1-P1.

Other circuits on the VHF mixer board are used during transmit and will be discussed in Section **4.5, Exciter.**

4.4.3 IF/FILTER BOARD—1A3A2

Refer to Figure 5.19

4.4.3.1 GENERAL

The IF/Filter board accepts the output of the VHF mixer, routes the signal through the selected bandpass IF filter and amplifies the resultant signal in the two IF amplifiers, U1 and U2.

4.4.3.2 DIODE GATES AND IF FILTERS

The signal from the VHF mixer board is fed to the IF/Filter board on pin 5 of 1A3A2-P1. This 10.5 MHz signal is amplified by Q3 and fed to the junction of diodes CR1, CR3, and CR5. Diodes CR1 and CR2 form a gate for the input of FL1, the LSB filter; CR3 and CR4 form a gate for the input of FL2, the AM filter; CR5 and CR6 form a gate for the input of FL3 the USB filter.

As the GSB-900SC uses "high side" conversion, that is, the first local oscillator is always higher in frequency than the received signal, the sidebands are reversed. This means that a lower sideband signal received at the antenna is converted by the mixer to an upper sideband signal at the 10.5 MHz I.F. To pass the upper sideband IF signal on to the detector, an upper sideband filter must be used. Therefore, FL1 is the filter used for receiving and transmitting the lower sideband, but is in reality an upper sideband filter. Similarly the upper sideband is received and transmitted by lower sideband filter, FL3.

The diode gates, which are also repeated at the filter outputs, operate as follows: Assume the LSB mode is selected. A +12VDC voltage is applied to pin 9 of 1A3A2-P1. This turns on CR8, CR1 and CR12. Using the input gate as an example, current flows through L8, CR8, R27, CR1 and R19. A

voltage of approximately +5VDC exists across R19 as a result, which turns off CR3 and CR5. CR2 is turned off because the cathode is more positive (+6V) than the anode (+4V). So the signal is allowed to pass into the filter. Additionally, the other filter input gates are turned off. Using CR3 and CR4 as an example, CR4 is conducting, (+4 VDC on its anode), with a path to ground for the cathode through R28 and R32. This shorts any signal leakage across CR3 to ground through C19; and CR3 is turned off with +5V on the cathode and +4V on the anode.

The input and output gates for the other filters operate in a similar manner. CR7, CR8, CR9 and CR10 prevent interaction with other control circuits.

4.4.3.3 INTEGRATED CIRCUIT IF AMPLIFIER

The filter output is fed through C37 to another diode gate, CR17 and CR18. This gate switches circuits from receive to transmit, so during receive, CR17 is turned on and CR18 is off. This allows the signal to go to pin 2 of U1, an integrated circuit amplifier. There it is amplified by approximately 30db and fed to pin 2 of U2, another integrated circuit amplifier. Schematics of U1 and U2,CA-3053, are given in Figure 4.5.

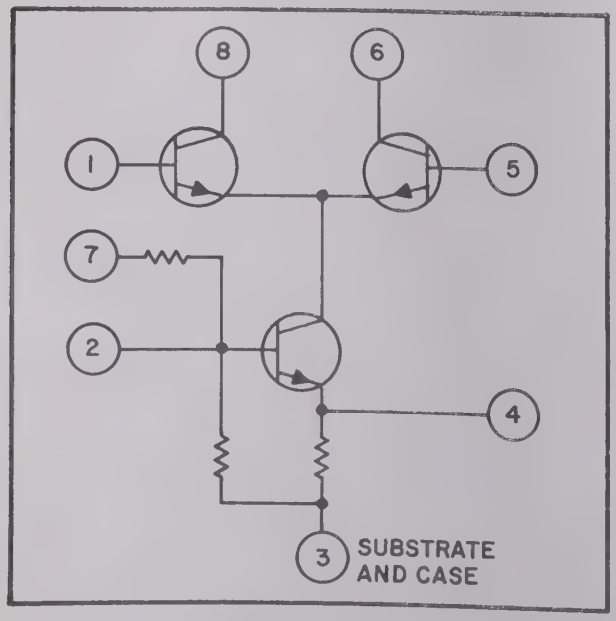


Figure 4.5 CA3053 Schematic of U1 and U2

The networks L3, C51, C52 and L4, C58, C59 are tuned to 10.5 MHz and are used for impedance transformation. The output of the I.F./Filter board is on pin 11 of 1A3A2-P1. AGC voltage for gain control of U1 and U2 is supplied through pin 13 of 1A3A2-P1.

Other circuits on the IF/Filter board are used during transmit and will be discussed in Section 4.5 Exciter.

4.4.4 AUDIO BOARD –1A3A4

See Figure 5.20.

4.4.4.1 GENERAL

The 10.5 MHz I.F. output from the IF/Filter board is supplied to pin 11 of 1A3A4-P1, and then is routed to two circuits: the product detector, Q6, Q8, and Q9, and the fixed gain I.F. amplifier, Q1.

4.4.4.2 FIXED IF AMPLIFIER AND AGC DETECTOR

The output from Q1 is fed to an emitter follower, Q2, to drive the AGC detector amplifier, Q3. A threshold bias is established on Q3 by R14 and R15. Any received signal of sufficient amplitude to overcome this pre bias, that appears at the base of Q3 will cause Q3 to conduct thereby lowering the collector voltage. This allows diode CR4 to conduct, reducing the base voltage on AGC amplifier Q4. In turn this causes the emitter voltage on Q4, which is the AGC voltage, to drop proportional to received signal strength. The "no signal" value of AGC voltage is approximately +8.8 VDC which provides maximum R.F. and I.F. gains. A signal of 100,000 uv will cause the AGC voltage to drop to approximately +2.5 to +3.0 VDC. The "no signal" AGC voltage is established primarily by R16 and R17. The AGC attack time is determined by R13 and C11. CR3 is used to equalize the load on Q2.

4.4.4.3 "S" METER AMPLIFIER

Transistor Q5 is a D.C. amplifier which drives the "S" meter. Its threshold is set so that meter move-

ment begins when a signal of approximately 2 or 3 uv is received, and provides full scale meter deflection for a 100,000 uv signal.

4.4.4.4 RF GAIN CONTROL AMPLIFIER

Amplifier Q12 is driven from the RF GAIN CONTROL to reduce the AGC voltage which in turn reduces the R.F. and I.F. amplifier gains. As the RF GAIN CONTROL is turned counter clockwise, the base voltage of Q12 is made more positive causing Q12 to conduct lightly at first, then more heavily to "pull down" the AGC voltage. With the RF GAIN CONTROL fully counterclockwise, it should be possible to completely disable the receiver.

4.4.4.5 AM DETECTOR

In addition to the AGC circuitry, amplifier Q1 also drives the AM detector, Q7 and Q10. Transistor Q7 is a high gain amplifier used to drive amplitude detector Q10 with a large signal for best linearity. Q10 is biased almost to cutoff so that it will detect amplitude variations. The output is reduced by R43 to equal the product detector output voltage. The AM detector is turned on in the "AM" mode by the +12R AM voltage on pin 7 of 1A3A4-P1.

4.4.4.6 PRODUCT DETECTOR

The product detector Q6, Q8, and Q9 combines the 10.5 Mhz I.F. signal with that of the 3rd local oscillator, 10.5 MHz. Q9 amplifies the 3rd L.O. and injects it into the detector where the R.F. components are removed by C29 leaving only the audio. The product detector is turned on only in USB, LSB, or CW by voltages on either pin 8 or pin 9 of 1A3A4-P1. CR1 and CR2 are diode gates used to prevent interaction between the +12 USB and +12 LSB lines.

4.4.4.7 600 OHM LINE DRIVER

Both the product detector output and the envelope detector outputs are combined in R42 and feed integrated circuit 600 ohm line driver, U1, and fixed gain audio amplifier Q11. The CA3020 line driver is a conventional push-pull multistage amplifier feeding output transformer T1. An internal schematic of the CA3020 is shown in Figure 5.20. The input to U1 is controlled by R48 and the balanced 600 ohm output appears on pins R and T of 1A3A4-P1. Pin S is the output transformer center tap and is not normally used. A side tone is provided from the CW oscillator through pin 4 of 1A3A4-P1 to the audio system of the receiver to allow monitoring of the CW signal. This sidetone is injected into the junction of the product detector output and the envelope detector output through capacitor C49. Resistor R46 attenuates the side tone to provide a comfortable listening level for the 1 kHz tone when the volume control is in a normal position.

4.4.5 SPEAKER DRIVER – 1A1A1

Refer to Figure 5.21.

The speaker driver is a hybrid integrated assembly capable of delivering five watts of audio to an eight ohm speaker. Since the circuit is designed for 24VDC and the GSB-900SC power supply furnishes regulated 28VDC, the diode string CR1 through CR6 is necessary to maintain constant voltage drop for the unit. Output to the speaker is taken through a 1000uf, capacitor (C2 and C3 in parallel), to provide good fidelity. Capacitor C4 reduces the high frequency response to eliminate high frequency hiss and noise.

4.5 EXCITER

The exciter is contained on three printed circuit boards; sideband generator board (1A3A3), IF/Filter board (1A3A2), and VHF mixer board (1A3A1). Since the GSB-900SC is a transceiver, a number of the same circuits and components are used in both the receive and transmit modes. A block diagram is shown in Figure 4.7.

4.5.1 GENERAL

Input to the exciter is available from three sources: microphone, 600 ohm balanced lines, or CW key. The microphone input signal is applied across the XMIT GAIN control on the front panel, then is amplified and fed to the balanced modulator. The 600 ohm balanced input is level controlled by an internal adjustment, then amplified and fed to the

balanced modulator. Keying the exciter, through the CW key, turns on a 1 kHz tone oscillator which is impedance matched through an emitter follower to the balanced modulator. The 1 kHz tone oscillator also supplies a side tone to the audio system to allow monitoring of the transmitted CW signal.

The balanced modulator takes an R.F. signal, 10.5 MHz, from the 3rd local oscillator amplifier, and "audio" from either of the above three sources. It then suppresses the R.F. carrier, 10.5 MHz, and supplies two signals as outputs: 10.5 MHz plus the audio frequencies (upper sideband, USB) and 10.5 MHz minus the audio frequencies (lower sideband, LSB). Hence, the output of the balanced modulator is double sideband, DSB. After amplification in a fixed gain I.F. amplifier, the DSB signal is gated into either the USB filter or LSB filter as selected on the front panel. AM operation in the GSB-900SC is, in reality, carrier plus USB only, so the AM filter is not used in transmit. The appropriate sideband filter eliminates the unwanted sideband and feeds through another diode gate into a bilateral amplifier. The gain of the bilateral amplifier is controlled by a peak voltage ALC and a VSWR ALC (automatic level control). The voltage ALC controls the peak transmitter output, and the VSWR ALC protects the P.A. transistors from high standing wave ratios.

The bilateral amplifier output is then impedance matched by an emitter follower, into which the AM carrier is injected from the automatic carrier control (ACC) amplifier.

The ACC detector operates on an average output level to maintain a constant carrier output. This helps prevent "carrier wipe out" by the ALC system. The emitter follower output is passed through a low pass filter to a balanced mixer. Notice that the transmit signal from the filter gate has been flowing in a direction exactly reversed from the receive signal flow. Therefore, this balanced mixer is the second VHF mixer described in the receiver section, and the second L.O. amplifier is the same as in receive.

The transmit output of the balanced mixer is the second L.O. frequency (80.75 MHz) plus the I.F. frequency (10.5 MHz) or 91.25 MHz. This output is amplified in the transmit side of the VHF bilateral amplifier, filtered in the 91.25 MHz crystal filter, and mixed again in another balanced mixer (the first mixer described in the receiver section). The 91.25 MHz signal is combined with the first local oscillator frequency to provide the desired frequency output between 1.6 and 30 MHz. The desired frequency signal is amplified in a pre-amplifier and a linear amplifier, then passes through a low pass filter. This is now the exciter output.

A detector, which monitors current in the power amplifier transistors, supplies a signal to provide an ALC to control the gain of the pre-amplifier stage, limiting the P.A. current to a safe level.

The following subparagraphs describe circuit operation of the individual circuits by printed circuit board.

4.5.2 SIDEBAND GENERATOR BOARD–1A3A3

Refer to figure 5.22.

4.5.2.1 GENERAL

The sideband generator board processes the audio input and translates the audio in a balanced modulator to a DSB suppressed carrier signal centered around 10.5 MHz. The board also contains ALC and ACC control circuitry.

4.5.2.2 AUDIO AND BALANCED MODULATOR

Microphone input is supplied on pin 18 of 1A3A3-P1. At this point the level has been set by the front panel XMIT GAIN control. The microphone audio is amplified by Q4 and feeds into the balanced modulator, CR3, CR4, CR5, and CR6. Resistors R31, R33, R36, and R37, in series with the diodes, equalize their forward conductions to permit a good carrier balance (null) to be obtained. Carrier balance is achieved by nulling the 10.5 MHz output with potentiometer R34 and capacitor C26. Transformer T1 is tuned to 10.5 MHz and capacitors C23, C24 provide an impedance transformation to match the input impedance of the next stage. The double sideband suppressed carrier signal output is on pin 16 of 1A3A3-P1.

R.F. carrier energy for switching the balanced modulator is supplied through pin F of 1A3A3-P1 and amplified by Q1.

4.5.2.3 AUTOMATIC CARRIER CONTROL (ACC)

A small amount of 10.5 MHz carrier is supplied to the automatic carrier control amplifier Q5 through a diode gate, CR1, CR2. This gate prevents carrier energy from being transmitted in USB, LSB, or CW modes, but allows the carrier to be passed and amplified in the AM mode.

The +12 AM(T) signal, on pin 5 of 1A3A3-P1, turns CR1 on and CR2 off. It also supplies operating voltage for ACC detector amplifiers Q2 and Q3, and carrier control amplifier Q5. At initial turn on in the AM mode, Q5 is operating at maximum gain supplying maximum carrier output on pin 1 of 1A3A3-P1. The ACC detector, located on 1A5A4, detects the output rise and when its output reaches a sufficient level at pin 17 of 1A3A3-P1, Q2 is turned on, which in turn causes Q3 to conduct. The conduction of Q3 lowers the emitter voltage on Q5, reducing its gain until stabilization is reached between carrier output level, ACC detector voltage, and carrier control amplifier gain. R18 adjusts the steady state current through Q3, which sets the gain of Q5, thereby establishing the value of carrier output from the transmitter.

Resistors R1 and R4 and capacitor C4 establish the attack and decay times for normal speech, while CR9 allows for a rapid decay in the event of excessive audio amplitude which would tend to "wipe out" the carrier.

4.5.2.4 600 OHM TRANSMIT AMPLIFIER

The 600 ohm transmit audio is supplied on Pin C of 1A3A3-P1 and passes through amplifier Q11 to the balanced modulator.

4.5.2.5 CW TONE OSCILLATOR

Transistors Q7 and Q8 form the 1 KHz tone oscillator. The frequency is determined by the "Twin T" notch filter C28, C29, C31, R38, R40, and R43. The oscillator is turned on by grounding pin 2 of 1A3A3-P1, causing transistor Q12 to conduct, which grounds the keyline and keys the transmitter. When the CW key is removed from ground, capacitor C37 and resistor R50 hold Q12 on for approximately one second. This prevents the keying relay from dropping out between normal CW characters and words, but automatically returns the transceiver to "Receive" after a key up of approximately one second. Diode CR8 prevents the tone oscillator from being energized during normal keyline operation.

Since the tone oscillator output is high impedance, an emitter follower, Q6, is required to drive the low impedance balanced modulator. A sidetone from the tone oscillator is sent out pin D of 1A3A3-P1 to the audio board, 1A3A4, for monitoring purposes.

4.5.2.6 VSWR AND VOLTAGE ALC AMPLIFIERS

Transistors Q9 and Q10 are ALC amplifiers for voltage ALC (Q10) and VSWR ALC (Q9). The VSWR ALC is set by a fixed resistance ratio, but the voltage ALC, which determines the peak power output of the transmitter, is set by potentiometer, R55. A discussion of the ALC operation will be presented in a later paragraph.

4.5.3 IF/FILTER BOARD–1A3A2

Refer to Figure 5.19

4.5.3.1 GENERAL

The IF/Filter board accepts the DSB output from the SB generator board, routes the signal through the selected SB filter and amplifies the resultant IF signal. Carrier injection for AM operation also occurs on this board.

4.5.3.2 TRANSMIT IF AMPLIFIER

The double sideband suppressed carrier output from the sideband generator is injected at pin 16 of 1A3A2-P1. Here it is amplified by a fixed gain IF amplifier, Q4. Application of +12 T to pin 10 of 1A3A2-P1 energizes Q4, turns CR18 on and turns CR17 off (+12R goes to ground during xmit, as +12T does during receive).

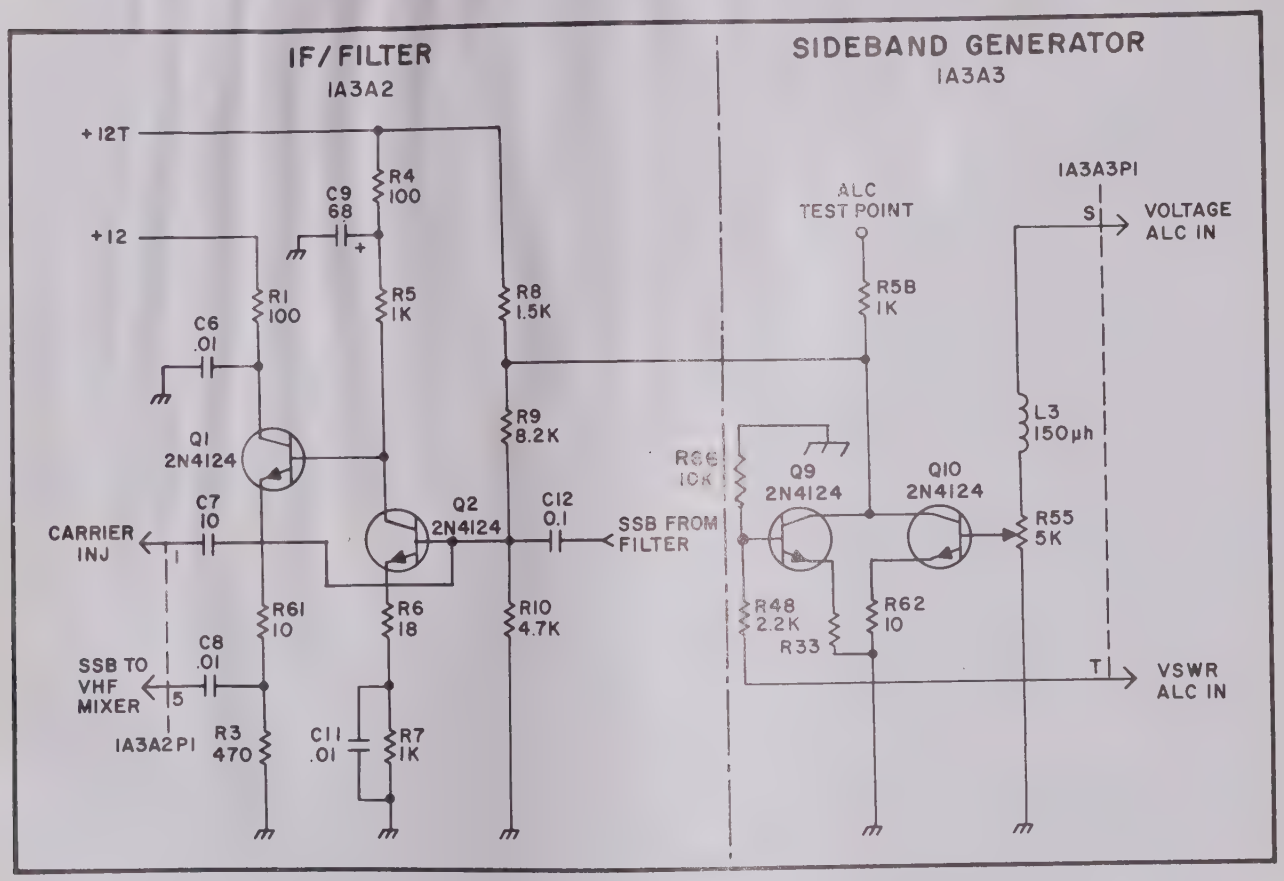


Figure 4.6 Voltage and VSWR ALC Control Schematic

4.5.3.3 TRANSMIT FILTER SELECTION

The front panel MODE switch selects the desired mode of operation, so the DSB signal passes through either the USB filter or LSB filter to eliminate the undesired sideband. Note that in the AM position, the +12AM(T) voltage selects the lower sideband filter in transmit, providing USB at the exciter output (See section 4.4.3.2 for an explanation of sideband inversion).

4.5.3.4 TRANSMIT GAIN CONTROL AMPLIFIER

The SSB signal thus produced is amplified in transistor Q2 and impedance matched to the output by emitter follower Q1. Note that in the bilateral amplifier Q1, Q2, and Q3, transistor Q3 is turned on only in receive, and Q1 and Q2 are turned on only in transmit.

Since the base of Q1 represents a high impedance, it is used as the carrier injection point for AM operation.

ALC controls the gain of transistor Q2 to limit its output when either the transmitter output has reached 100W peak, or the output transistor voltage rating is in danger of being exceeded by a high voltage standing wave ratio (VSWR) at the transmitter output. Figure 4.5 shows the full ALC loop control .When a voltage appears at 1A3A3-P1 pin T or at the base of Q10 of sufficient amplitude to bias either Q9 of Q10 "on", the appropriate transistor conducts through R8, on 1A3A2, causing a large voltage drop to appear across R8. This decreases the bias voltage on the base of Q2, reducing its gain and the output from pin 5 of 1A3A2-P1.

4.5.4 VHF MIXER –1A3A1 (Transmit)

Refer to Figure 5.18.

4.5.4.1 GENERAL

The IF signal from the SB generator board is up converted to 91.25 MHz, filtered and then mixed with the first LO frequency to yield the desired transmit RF output frequency. ALC current control is also performed on this board.

4.5.4.2 LOW PASS FILTER AND BALANCED MIXER

The SSB (or AM) signal from the IF/Filter board enters the VHF mixer board on pin 5 of 1A3A1-P1. From there, it passes through a low pass filter, C62 thru C66, L14 and L15, to attenuate harmonics of the 10.5 MHz signal. Then it is injected into a balanced mixer at the center tap of T9. Operation of the balanced mixers is described in Section 4.4.2.

4.5.4.3 TRANSMIT BILATERAL AMPLIFIER AND FILTER

The 10.5 MHz signal is converted up to 91.25 MHz and fed to the bilateral amplifier. In transmit, Q7 is activated and Q6 is turned off (again see Section 4.4.3 for discussion). Input to Q7 is at T8, and the output is T7. Capacitors C55 and C56 match between the low impedance of the mixer and the high impedance across T8. At the output, C46 and C47 provide impedance matching into the filter matching network, L11 and C44. The 91.25 MHz signal is filtered by FL1 to remove unwanted mixing products. C41 and L10 match the filter impedance to the balanced mixer, CR4 thru CR7.

4.5.4.4 BALANCED MIXER AND RECEIVER SHUT DOWN

The balanced mixer combines the 91.25 MHz signal with the first L.O. providing a difference frequency equal to the desired output frequency. This signal now has the sideband reversed per the earlier discussion, in paragraph 4.4.3.2, and is fed to the pre-amplifier Q3. The +12T voltage at pin 10 of 1A3A1-P1 turns on Q1 and Q3 and turns off diode CR3. During transmit, +12R goes to ground, but the AGC voltage remains at approximately +9VDC on pin 13 of 1A3A1-P1, which turns diode CR1 on. This drops the voltage on gate 2 of Q2 to approximately +1 VDC, turning off Q2. This prevents transmit loop oscillations by breaking the path between RF input (Receive) on pin 15 of 1A3A1-P1 , and input to the transmitter preamplifier at C34.

4.5.4.5 EXCITER LINEAR AMPLIFIER

The signal is amplified in Q3 and Q1 and passed through a low pass filter, C10, C11, C12, C19, C20, L6, and L7, to pin 8 of 1A3A1-P1.

4.5.4.6 CURRENT ALC AMPLIFIER

Transistor Q4 is the current ALC control stage which, upon conduction, causes a large voltage drop to appear across R18, reducing the base bias on Q3 thus lowering its gain. During receive, +12R voltage through CR13 and R48 keeps Q4 turned on, and capacitor C36 charges to +12V. When the transmitter is keyed, CR13 is turned off and C36 must discharge through R48 into Q4, keeping Q4 turned on, and Q3 turned off for approximately one millisecond. This allows "Switch On" transients to be dissipated before the P.A. receives the signal.

Whenever the P.A. current exceeds a preset threshhold, a DC voltage appears at pin U of 1A3A1-P1. This turns Q4 on, reducing the gain of Q3, which decreases the output and brings the P.A. current back to a safe level.

4.5.5 RECEIVER/EXCITER MOTHER BOARD

The schematic of the Receiver/Exciter mother board is illustrated in Figure 5.23. This unit consists of four receptacles, their circuitry and related components. It is located under the chassis below the Receiver/Exciter module to mount four printed circuit boards (1A3A1, 1A3A2, 1A3A4, and 1A3A5). Refer to Figure 5.7 for proper orientation.

4.6 R.F. POWER AMPLIFIER 1A7A1

4.6.1 GENERAL

The power amplifier consists of three push-pull stages: predriver, driver, and output. The predriver amplifies the 10 milliwatt output from the exciter to the 1 watt level; the driver amplifies this to the ten to twenty watt level, and the output stage amplifies this to the 100 watt level. A schematic diagram of the power amplifier is shown in Figure 5.24.

4.6.2 PREDRIVER, DRIVER AND POWER AMPLIFIER

Input from the exciter is connected to 1A7J1. Transformer T1 converts the single ended exciter input to push-pull to drive the predriver Q1 and Q2. Bias for the predriver (for AB2 operation) is taken from CR1, which is in a forward conduction state. C2, R4 and C3, R5 are feedback networks for gain stabilization. The driver, Q3 and Q4, is driven push-pull through T2, and obtains its bias from CR2. The output stage, Q5 and Q6, is fed push-pull through T4 and obtains its bias from CR3. Note that all bias lines are tied together and are not energized during receive. This minimizes the receive current drain for the GSB-900SC. The single ended output is taken at 1A7J2 from T6.

4.6.3 CURRENT ALC DETECTOR

Transistor Q7 monitors the voltage across resistor R24. The values of R18 and R19 have been chosen to cause Q7 to conduct heavily when a current of 10 amperes or more flows through R24. Thus when Q7 is turned on, a voltage appears across R33 and 1A7A1-J3 Pin B. This voltage controls the current ALC amplifier on the VHF mixer board.

4.6.4 VSWR ALC DETECTOR

A detector circuit, R30, R31, CR4 and C28 is coupled to the collector of Q6 to monitor the collector AC voltage. If the voltage should exceed 65V peak (normally caused by high VSWR), the voltage appearing on pin D of 1A7A1-J3 causes the VSWR ALC amplifier on the sideband generator board, 1A3A3, to reduce the transmit I.F. gain to bring the output to within safe limits for the output power transistors.

4.7 POWER SUPPLY 1A6

Refer to Figure 5.25.

4.7.1 GENERAL

AC input is brought in through 1A6P1 Pins 1,3,5, and 7. The input windings are appropriately strapped by the power connector; ie, for 115V operation, the primary windings are in parallel, and for 230V operation, the primary windings are in series. For continuous operation at line voltages 15% higher than 115V or 230V, taps are provided on terminal board TB1. Regulated DC output voltages of +28, +12 and +5 volts are provided for operation of the transceiver.

4.7.2 28VDC REGULATOR

The A-C output for the 28V regulator is rectified by 1A6-CR1 thru 1A6-CR4 and filtered by 1A6C5. Transistor Q2 is connected as a constant current source to feed zener diode CR3, and the base of the series regulator transistor, 1A6-Q101.

Two protection circuits are provided to prevent damage to the regulator transistor and to the sections of the GSB-900SC utilizing the +28VDC power. If the +28VDC is inadvertently short circuited or the current drawn from the supply exceeds approximately 16 amperes, the current through resistor R2 causes Q5 to conduct, sending a voltage pulse to SCR Q6, which grounds the base of 1A6-Q101, turning off the regulator. This circuit must then be recycled by shutting off the transceiver input power and waiting approximately 15 seconds for 1A6C5 to discharge.

If the regulator transistor,1A6-Q101, should ever fail short circuit, approximately 42VDC would appear on the output causing damage to the audio speaker driver and the R.F. power amplifier. CR4 is a zener diode which will conduct when the output voltage reaches 35 VDC, sending a voltage pulse to SCR Q104. This will cause Q104 to conduct, blowing fuse F1 (See Figure 5.25), preventing damage to components using 28 VDC.

4.7.3 12 VDC AND 5 VDC REGULATORS

The +12 VDC and +5 VDC power supplies are very similar in design. Each uses a bridge rectifier assembly, U1 or U3, to obtain DC, then filters the AC component in capacitors C5 or C9. Both supplies use integrated circuit voltage regulators for maximum ripple reduction and excellent regulation. The main circuit differences are the methods in which the I.C. internal reference sources are utilized to obtain the desired output voltage. The integrated circuits drive series regulator transistors to supply the normal 1 ampere currents.

Protection circuits are also built into these two supplies. Resistors R6 and R14 monitor the current and supply a feedback voltage to the regulator to limit the current to 3 amperes. This current level will cause no damage to the power supply but will, in the case of a short circuit, blow the 2 amp fuse, F2 or F3 (See Figure 5.25), after approximately 10 seconds. Therefore, a momentary short circuit on either supply (such as carelessness during troubleshooting) will go unnoticed, but a prolonged short circuit will blow the fuse..

In addition, should the series regulator fail short circuit for any reason, voltages higher than the regulated voltages could appear on the outputs causing damage, Zener diodes CR7 or CR8 will conduct if the voltages rise beyond safe points, and they then send a voltage pulse to SCR Q3 or Q4 causing it to conduct and blow its respective fuse.

4.7.4 REGULATOR TRANSISTOR LOCATIONS

The series regulator transistor for the +12 volt supply is physically located on the main power supply chassis. The +28 VDC series regulator, 1A6-Q101, is physically located on the regulator heat sink at the rear of the transceiver.

4.7.5 D.C. INVERTER -1A6A2

Figure 5.26 shows a schematic of the DC inverter.

Basically, the inverter is a transistor oscillator utilizing a saturable core. Upon application of D.C. voltage to the oscillator, Q1 and Q2, slight differences between the two transistors causes one to conduct more heavily than the other and it quickly reaches saturation. Once this occurs, no further change in current is noted and the field in transformer T1 collapses, driving the "on" transistor to an "off" state and the "off" transistor to an "on" state. When the second transistor reaches saturation, the cycle reverses. The result is a square wave oscillator capable of many amperes of current.

Transistors Q1 and Q2 supply the square wave current to the power transformer primary (1A6T1) for 13V or 26V operation. The saturable core transformer design used here allows only 1A6A2-T1 to saturate, and then at a relatively low current level (minimum power dissipation) and prevents the main power transformer from saturating. This eliminates voltage "spikes" in the output. Initial "turn on" bias is established by R1, R2, and R7. Diodes CR1, CR2 and associated components R5, R6 and C1, form an additional "despiking" network to insure that a clean wave form appears at the output.

NOTE

R1 on the DC inverter board (1A6A2) must be short circuited by the two position locking switch S1 when the transceiver is operated on 13VDC. Refer to paragraph 2.6 for instructions when changing DC operating voltage.

Relay K1 is used to keep the oscillator transistors within allowable ratings during AC operation of the power supply. This allows the DC modules to remain connected to the power supply without damage during AC operation. Note that for 13 VDC operation, the transistor collectors (Q1 and Q2) are connected to the 13V power transformer input windings 2 and 6 on TB2, and the board jumper is across E10 and E11, shorting out R1. For 26VDC operation, the transistor collectors (Q1 and Q2) are connected to the 26V power transformer input windings 1 and 7 on TB2 and the board jumper is between E9 and E10, inserting R1 into the bias circuit.

Either positive or negative ground DC sources may be used, since the DC input circuit on the GSB-900SC is floating with respect to ground. Figure 4.7.

5024000022A

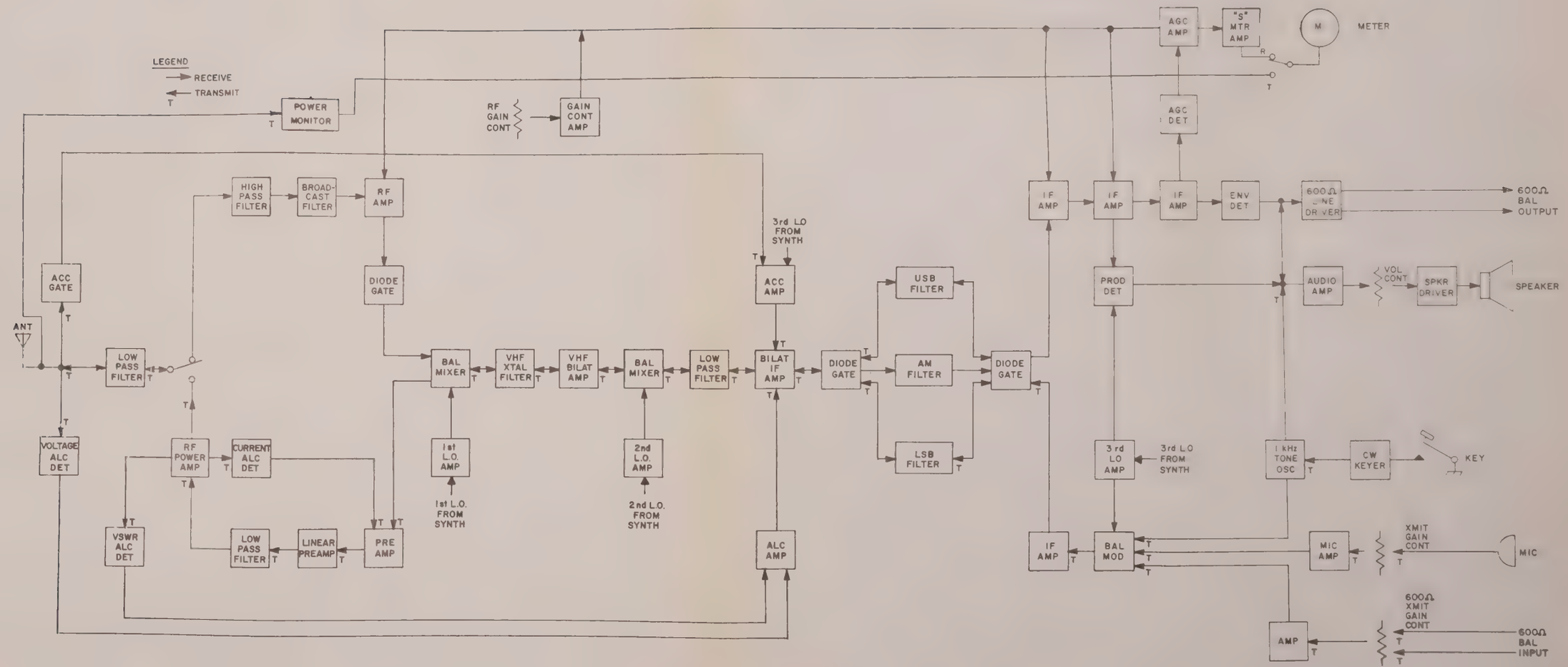


Figure 4.7 GSB-900SC Transceiver Block Diagram

shows a schematic of the DC relay control circuit. It is basically a voltage regulator which supplies 12VDC to relay 1A8K2 regardless of input voltage, 13V or 26V. Diode CR2 prevents energizing of the circuit if the polarity of the input voltage is incorrect. This prevents damage to the D.C. inverter.

The oscillator transistors, Q1 and Q2, are physically located on the power supply heat sink at the rear of the transceiver, and are mounted in a line directly beneath the 28VDC regulator transistor, 1A6-Q101 (See Figure 3.2). The DC relay and control circuit are located on a bracket attached to the front of the receiver/exciter assembly (See Figure 5.7).

4.8 FILTER MODULE 1A5

A block diagram of the filter module is given in Figure 4.9. The filter module consists of four printed circuit boards: odd channel filter board, even channel filter board, receive filter board, and motor control board. Figure 5.27 shows the position of each board within the module enclosure. An arrow has been etched into each board as an aid in keying all boards together.

4.8.1 GENERAL

The filters are arranged to provide low pass filtering in the transmit mode and band pass filtering in the receive mode by switching in high pass filters during receive mode only. Therefore, only the transmit low pass elements must handle 100 watts of power and the high pass receive elements utilize small low power inductors. The low pass and high pass filters are all 5 pole elliptical design with an ultimate attenuation of 40db. This attenuation is added to that normally present in the RF power amplifier to give excellent harmonic attenuation. Because of the required size of the transmit filter inductors, these filters have been divided among two boards: odd channel filters, 1,3,5, and 7, and even channel filters 3, 4, 6, and 8. Figure 4.9 shows filter band numbers and their frequency ranges.

The bands are automatically selected by the front panel digital frequency control switches.

Schematic diagrams of the filter boards are given in Figures 5.29, 5.30, and 5.31. Note that unused filters are shorted together and taken to ground through 10 ohm resistors. This effectively "de Q's"

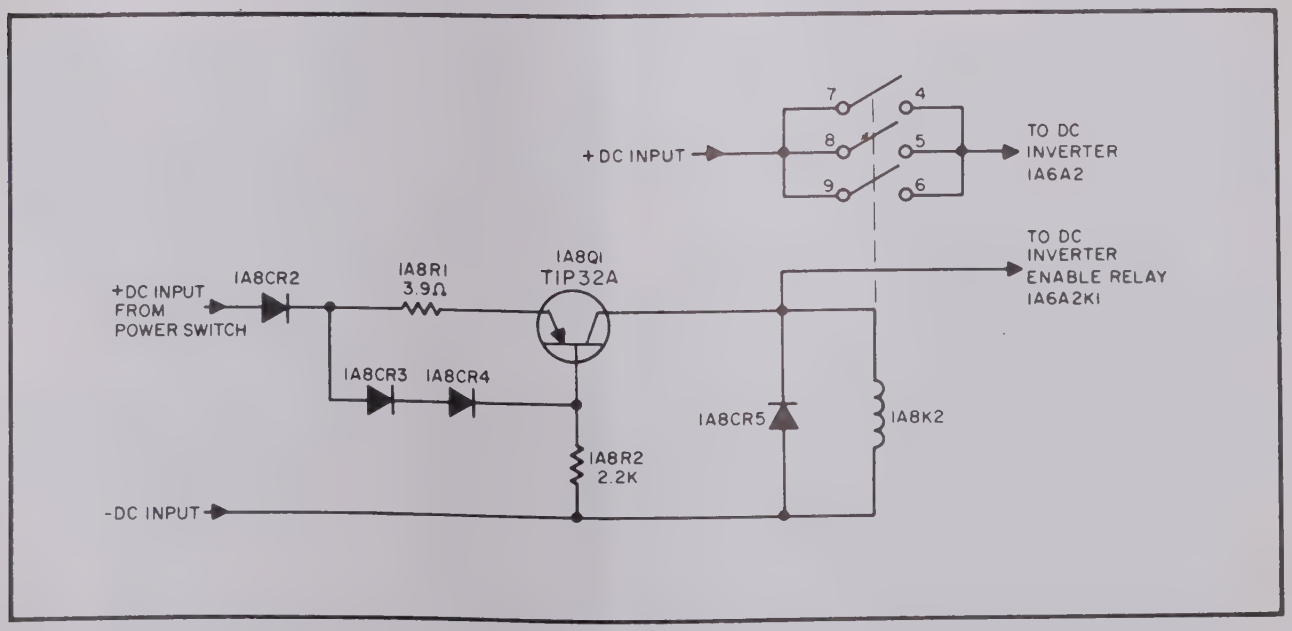


Figure 4.8 D.C. Relay Control Circuit

BAND NUMBER	FREQUENCY RANGE
1	1.6 to 1.9999 MHz
2	2.0 to 2.9999 MHz
3	3.0 to 3.9999 MHz
4	4.0 to 5.9999 MHz
5	6.0 to 8.9999 MHz
6	9.0 to 12.9999 MHz
7	13.0 to 19.9999 MHz
8	20.0 to 29.9999 MHz

Table 4.4 Filter Module (1A5) Filter Band Numbers & Frequency Range Table

the unused filters and prevents interaction with the filter that is active.

4.8.2 MOTOR CONTROL BOARD

The motor control board (1A5A4) incorporates components associated with the channeling circuitry. It also includes the voltage ALC detector, the ACC detector, and the output level detector. Refer to Figure 5.28.

Channeling of the band switch is accomplished by applying +12VDC to any of the band control lines. This causes the relay, K1, to be energized, in turn energizing the motor, B1, causing the open seeking wafer S1 to rotate until it finds the band line with the +12VDC. At this point the circuit is broken and the relay drops out, shorting out the motor. This provides dynamic braking which stops the motor very rapidly, preventing excessive overshoot. Diode CR1 prevents the back EMF of the motor from keeping the relay energized and allowing the motor to coast through the open position and again establish contact. Capacitors C1 and C2, and inductor L1 form a hash filter to remove brush noise from channeling motor.

4.8.3 VOLTAGE ALC DETECTOR

The voltage ALC detector consists of a resistive voltage divider R25 and R26, an RF detector CR17, and emitter followers Q2 and Q3. This combination provides an extremely fast and responsive ALC. The detector output drives the emitter followers to charge capacitor C28, which discharges through R24. The decay is long enough to eliminate the audio modulation from the ALC line. Capacitor C24 is adjusted to provide optimum ALC performance over the complete frequency range of the transceiver.

4.8.4 ACC DETECTOR

The ACC detector derives its output by rectifying the voltage at the antenna connector with diode CR6 and diode CR12. The voltage is decreased by resistors R4 and R5. This detector has a fast rise and fast decay time at this point, so it is necessary to increase the time constant to maintain a constant carrier level. This averaging network is located on the sideband generator board.

4.8.5 OUTPUT DETECTOR

The output detector CR5 samples the transmit output voltage at the antenna terminal and provides a relative power output signal to the front panel meter when the coupler control panel is not used.

4.8.6 KEY LINE

Relay K2 is used in conjunction with relay 1A8K1 to key the transceiver to transmit mode. A sch-

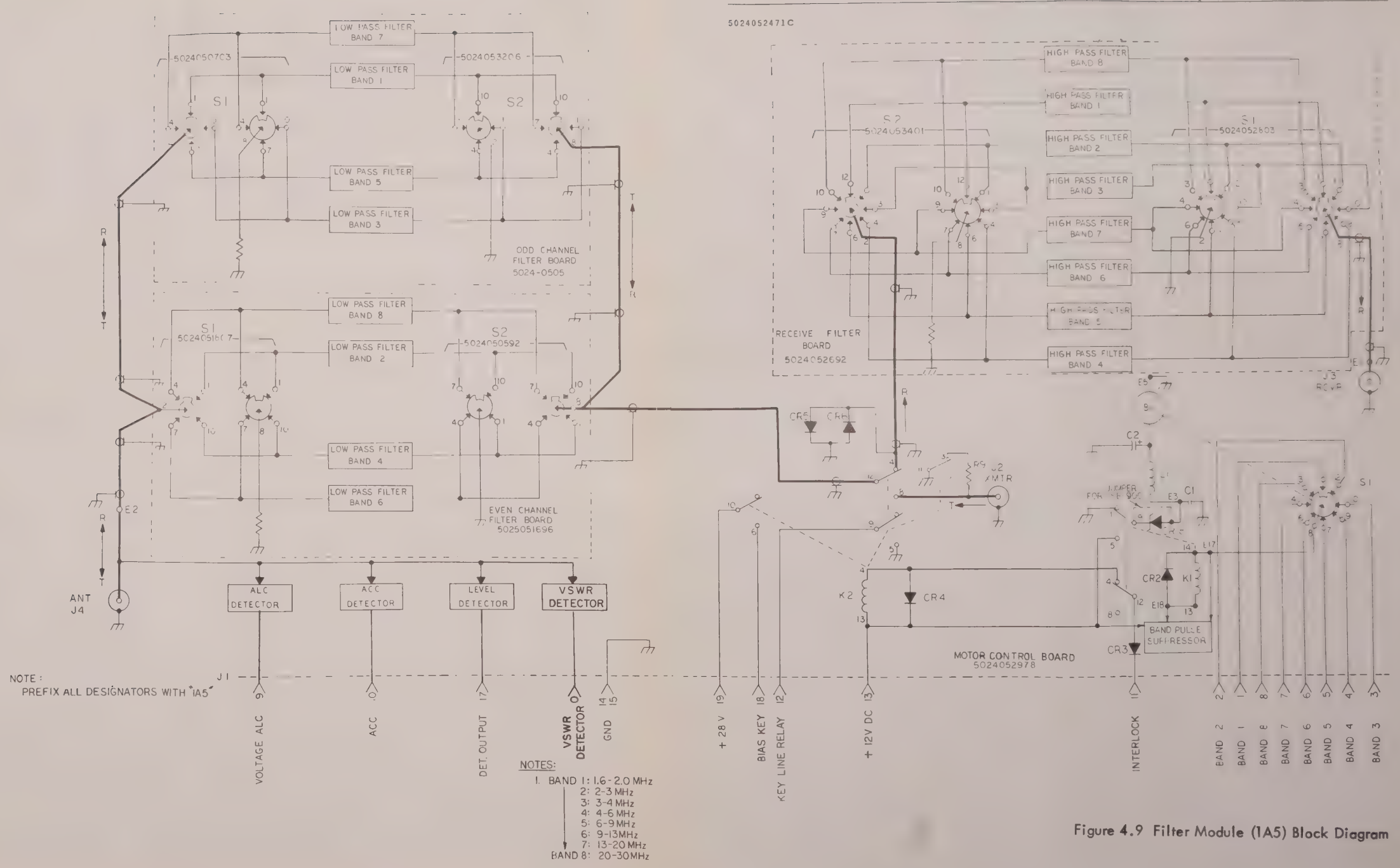


Figure 4.9 Filter Module (1A5) Block Diagram

5.4.2 PRELIMINARY

a. Connect AC power cable to rear panel connector J3 and to a 115 AC, 50 to 60 Hz, 1 phase power source (or 230 VAC, if a 230 VAC power cable is used).

b. Using the coaxial cable, connect the rf signal generator, paragraph 5.4.1 item A, to the rear panel antenna connector, J1.

c. Set front panel controls to the following positions listed in Table 5.1.

Refer to Figure 5.8 for Front Panel wiring and Figure 5.10 for Main Frame wiring diagrams with their appropriate parts lists.

SWITCH or CONTROL	POSITION
FREQUENCY Switches	01.6000 MHz
FREQUENCY Control Mode Keyswitch	Normal
MODE Switch	LSB
RF GAIN Control	Fully Clockwise
XMIT GAIN Control	Fully Counter Clockwise
DIMMER Control	Fully Counter Clockwise
VFO Control	PUSH IN
VOLume Control	Fully Counter Clockwise

Table 5.1 Front Panel Control Test Positions

5.4.3 POWER SUPPLY (1A6)

STEP No.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1	Power Turn On		Perform Steps A thru C of paragraph 5.4.2	
2	+5 VDC	VOM on 10 VDC range, common lead on chassis ground, "+" lead on either lead of 0.22 ohm resistor, R14 on regulator board 1A6A1.	Read Voltage on VOM	VOM should read between +4.75 and +5.25 volts. If not, check line fuses 1A8F1 and 1A8F2, and fuse 1A6A1 F3 on regulator board, and 1A6A1Q4 and associated circuitry.
3	+12 VDC	VOM on 50 VDC range, common lead on chassis ground, "+" lead on either lead of 0.22 ohm resistor, R6, on regulator board, 1A6A1.	Read voltage on VOM	VOM should read between +11.2 and +12.8 volts. First check fuse 1A6A F2 on regulator board, and 1A6A1Q2 and associated circuitry.
4	+28 VDC	VOM on 50 VDC range, common lead on chassis ground, "+" lead on Pin A of power amplifier connector 1A8P1.	Read voltage on VOM	VOM should read between +26.5 and +29.5 volts. If not, check fuse 1A6A1 F1, transistor 1A6Q101, and 1A6A1 Q2 and associated circuitry.

5.4.4 FRONT PANEL (1A1) AND MAIN FRAME (1A8)

1	DIMMER		Advance DIMMER switch fully CW.	Meter and frequency dials should be lighted. If not, check cabling in front panel and main chassis for broken or shorted wires.
2a	LOW LIMIT FREQ. light		Turn frequency switches to 1.5000 MHz	LOW LIMIT FREQ. lights should be lit and "S" meter should read full scale. If not, check cabling around front panel switches S1, S2, and S3.
2b	Same as 2a above		Turn frequency switches to 1.6000 MHz	LOW LIMIT FREQ. light should be out and "S" meter should read zero. If not, check transistor 1A3A4 Q4 on audio board.
3a	VFO Control		Pull out VFO control	Lamp above VFO control should be lighted.
3b	Same as 3a above		Push in VFO control	Lamp above VFO control should be out.
4	AUDIO jack		With VOLUME control approximately 1/2 CW, turn SPEAKER switch to ON.	Noise should be heard in the background coming from the speaker.
5	L.O. Blanker (1A8A1)		Sequence 1 MHz Frequency control switch through each of its positions (both clockwise and counterclockwise) with MODE switch in USB.	Brief blanking of receiver noise whenever switch position is changed. If faulty, refer to schematic and check voltages and waveforms.

5.4.5 RECEIVER TEST

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1			Perform steps a thru c of par. 5.4.2.	
2	Sensitivity	Audio VTVM on phone jack on front panel for steps 2 through 7.	Turn VOLUME control to 1/4 CW. Set RF signal generator to 50 microvolts at 16.0 MHz and adjust frequency for a peak audio signal on audio VTVM.	Peak indication. If none, consult sections 4.3.2, 4.3.3, and 4.3.4. Check for synthesizer outputs at LO 1, LO 2, and LO 3 on Receiver/Exciter Mother Board 1A3A5. See section 5.5.
3	Same		Remove coax cable from RF signal generator output. Adjust GSB-900SC VOLUME control for audio VTVM reading of -10db on 30 MV scale.	-10db on 30 MV scale.
4	Same		Reconnect coax cable to RF generator and set generator to 0.5 microvolts (into 50 ohms).	Minimum 10db increase over level in step 3. If not, realign VHF mixer board (1A3A1) and IF/Filter Board (1A3A2). See par. 5.6.1 and 5.6.2.
5	Same		Set MODE switch to USB and repeat steps 3 and 4 above.	If no output, check MODE switch wiring for broken wire and check switching diodes on IF/Filter Board (1A3A2).
6	Same		Adjust RF signal generator frequency for "zero beat", and increase output to 3 microvolts (into 50 ohms). Set MODE switch to AM position and adjust VOLUME control for audio VTVM reading of -10db on 30 MV scale.	-10db on 30 MV scale. If no output, check MODE switch wiring for broken wire and check switching diodes on IF/Filter board (1A3A2).
7	AM Sensitivity		Turn on 30% modulation at 1 kHz on RF signal generator.	Minimum 10db increase over level in step 6.
8	AGC Control	Audio VTVM on PHONE jack on front panel and VOM on 10 VDC range, between test point on audio board and chassis ground for steps 8 thru 15	Remove 1 kHz modulation and set signal generator output to zero, set MODE switch to USB.	VOM should read between 11 and 9 of VDC, "S" meter should read zero. If "S" meter reads full g around RF gain control and transon the audio board , (1A3A4).
9	Same		Set signal generator output to 5 microvolts and adjust frequency for peak audio VTVM reading.	VOM should read down scale and "S" meter should begin to read upscale.
10	AGC Control		Adjust GSB-900SC VOLUME control for audio VTVM reading of -10db on the 1 volt scale.	-10db on 1 volt scale.
11	Same		Increase RF signal generator output to 500,000 microvolts.	VTVM should increase 15db or less from reading in step 10, and "S" meter should read full scale. If not, check 1A3A4 Q5 and associated circuitry.
12	RF GAIN control		Turn RF GAIN control fully counter clockwise.	Reading on VTVM should decrease at least 30db from reading in step 11. If not, check wiring on RF GAIN control and 1A3A4 Q12.
13	Same		Turn RF signal level to zero.	"S" meter should remain at full scale.
14			Turn RF GAIN control fully clockwise.	"S" meter reading should decayto zero.
15	SPEAKER		Turn RF signal generator level to 5 microvolts and turn SPEAKER switch to ON.	Audio present at speaker.
16	600 ohm AUDIO OUTPUT	Audio VTVM between pins E and F of rear panel AUDIO connector 1A8J2.	Set RF signal generator to 100 mocrovolts. Adjust potentiometer, R48, on the audio board (1A3A4), to provide a VTVM level of 'O' dBM (800 MV RMS).	'O' dBM reading. If not, check integrated circuit, 1A3A4 U1, and associated circuitry.

5.4.6 TRANSMITTER TEST

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1		Dummy load connected through coaxial cable to rear panel ANT connector, 1A8J1 through coax-tee connector. HP410B VTVM connected to remaining port of coaxtee for steps 1 thru 8.	Frequency dials set for 16.0000 MHz, mode switch at LSB, XMIT GAIN fully counterclock-wise	
2	AM Carrier check & adjustment		Turn mode switch to COUPLER TUNE. Adjust potentiometer, R18 (ACC Control), on sideband generator board (1A3A3) to give a VTVM read-ing of 42 VRMS.	VTVM should read 42 VRMS. If not, check relays 1A8K1 and 1A5K2, Diode 1A8CR6 (on rear panel ACCESSORY connector 1A8J4), see sections 4.4 and 4.5. If RF power amplifier is suspected, see section 5.8.4.
3	CW Power output check & adjustment sidetone check		Turn MODE switch to CW position, insert CW key in KEY jack on front panel. Turn SPEAKER switch ON and adjust VOLUME control to 1/3 CW. Depress CW key and adjust ALC control, R55, on sideband generator board (1A3A3) to give a VTVM reading of 71 VRMS.	VTVM should read 71 VRMS. If not check Q6, Q7, Q8 and Q12, and associated circuitry on sideband generator board (1A3A3). A 1 kHz tone should be heard through the speaker when the key is depressed and the transmitter should remain keyed for approx-imately one second after the CW key is released. If not, check 1A3A3 Q12 and associated circuitry.
4	CARRIER NULL		Insert microphone into MIC connector on front panel. Turn XMIT GAIN fully CCW. Turn MODE switch to USB and depress microphone push to talk switch. Adjust carrier balance controls R34 and C26 on the sideband generator (1A3A3) for the best null.	VTVM should read less than .5 VRMS. If not, check CR3, CR4, CR5, CR6, and associated circuitry on the sideband generator (1A3A3) for defective components.
5	USB		Turn XMIT GAIN control to approximately 1/3 CW. Key microphone and speak in a normal voice, holding microphone within 1/2 inch of lips. Observe VTVM reading.	VTVM should show a peak reading of 70 VRMS. If not, check wiring around MIC connector and chassis and check 1A3A3 Q4 and associated circuitry, check voltage ALC circuits.
6	LSB		Turn MODE switch to LSB repeat step 6 above.	VTVM should show a peak reading of 70 VRMS.
7	AM		Turn mode switch to AM repeat step 6 above.	VTVM should read approximately 42 VRMS until modulation is applied, then will rise to a peak of approximately 70 VRMS.
8	600 ohm input	Connect audio VTVM and audio oscillator, set to 1 kHz, to pins band C of AUDIO connector 1A8J2 located on the rear panel.	Adjust audio oscillator output for '0' dBM on the audio VTVM. Turn XMIT GAIN control full CCW, and MODE switch to USB. Key transmitter with microphone and adjust R58 on audio board 1A3A4, until RF VTVM reads 70 VRMS.	If no output is obtained, check cabling, 1A3A4 T2, 1A3A4 R58, 1A3A3 Q11, and associated circuitry.
9	I.F. Gain adjustment	Same as in 1 above	Set FREQUENCY dials for 29.99 MHz. Extend VHF Mixer out of card basket using extender card. Turn 1A3A1R16 fully CCW. Place MODE switch in CW and depress CW key. Turn 1A3A1R16 CW until power output levels off. Advance 1A3A1R16 approx.15 ° beyond this point. Replace VHF Mixer in card basket.	VTVM reading between 67 and 71 volts RMS.

5.5 SYNTHESIZER

The following paragraphs provide troubleshooting and fault isolation information for those problems peculiar to the synthesizer.

5.5.1 FAULT ANALYSIS

The Synthesizer Fault Analysis Table, contained in the following subparagraphs, is designed to isolate a faulty assembly first and then a faulty stage. If the defective assembly has been isolated by substitution, then the technician may proceed directly to the appropriate paragraph to isolate the faulty stage. Once a defective stage has been found, refer to the appropriate circuit diagram and make voltage checks to isolate the faulty component.

5.5.1.1 PRELIMINARY CHECKS

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE	IF FAULTY, CHECK-
1	Freq. Std. output	Oscilloscope probe at X1A4A1 pin S.	Check for proper wave form.	300 to 900 mv p-p sine wave, 200 nsec. rep. rate	a) Freq. Std. (1A8U1) and associated wiring. b) Spectrum Gen. (1A4A1) for shorted input.
2	Freq. Std. Alignment	Same as step 1 above except connect Frequency Counter to Vertical Output of oscilloscope.	Measure frequency. If out of tolerance: remove access screw at top of Freq. Std., adjust Frequency Trim and replace access screw.	Frequency within ±5 Hz of 5.000000 MHz.	If proper alignment cannot be obtained, Frequency Standard must be replaced.
3	Low Digit Phase Lock	Oscilloscope probe at test point 1A4A2TP3.	Set all FREQUENCY knobs to "0". Refer to Low Digit Gen. schematic and check waveform.	D.C. level of 1.5V to 2.5V	a) H.F. VCO Coarse Steering Voltage (see table 5.9) If faulty, check R12 through R22 located on the back of the 10 kHz switch (1A1S4). Also check associated front panel wiring. b) 1 kHz and 17 MHz references (consult Spectrum Gen., 1A4A1 schematic). If faulty, check Spectrum Gen.

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE	IF FAULTY, CHECK-
					c) Frequency Control lines (consult tables 5.2 thru 5.8). If faulty, check Frequency control switches on front panel and associated main frame wiring. d) Low Digit Gen. voltage readings (consult schematic). e) Low Digit Gen. alignment (See section 5.5.2.2).
4	VHF Loop Phase Lock	Oscilloscope probe at test point 1A4A4TP1.	Set all FREQUENCY knobs to "0". Consult VHF Divider schematic and check waveform.	D.C. level of 1.5V to 2.5V	a) VHF VCO Coarse Steering Voltage (see table 5.8). If faulty, check R1 thru R11 located on the back of the 1 MHz switch (1A1S2). Also check associated front panel wiring. b) Translator output (consult Translator schematic and if faulty, repair translator section 5.5.2.3). c) Frequency Control lines (consult tables 5.2 thru 5.8) If faulty check Frequency Control switches on front panel and associated wiring. d) VHF Divider voltage readings (consult schematic). If faulty repair VHF Divider. e) VCO output (consult VCO schematic and section 5.5.2.5). If faulty repair VCO.
5	VFO operation	Oscilloscope probe at 1A4A3U2 pin 6. Connect Vertical Ampl. output of oscilloscope to Frequency Counter (place Translator on extender card)	Pull out front panel VFO control. Rotate control to both extreme positions and measure frequency.	Minimum adjustment range of 20.995 to 21.005 MHz	a) VFO control voltage range at 1A4A3 pin A. Normal range is 4.2V (control CW) to 12V (control CCW). If faulty, check VFO control (1A1R27) on front panel and associated wiring. b) VFO ON/OFF control line. Should be +12V with control pulled out and OV with control pushed in. If faulty, check VFO control (1A1R27) on front panel and associated wiring. c) Faulty component in Translator VFO circuit. Consult Translator schematic and perform voltage check. d) Misalignment of VFO circuit in Translator. Consult alignment procedure (section 5.5.2.3).

5.5.1.2 FREQUENCY CODING

The following tables (5.2 thru 5.8) are provided to assist in making the preliminary checks described in this section.

10 MHz DIAL	X1A4A5 Pin Numbers (Function)		
	18(Band "0" Command)	17(Band "1" Command)	16(Band "2" Command)
0	0	1	1
1	1	0	1
2	1	1	0

NOTE

1. *A "0" indicates short circuit to chassis ground*
2. *A "1" indicates open circuit to chassis ground*
3. *All readings taken with VCO (1A4A5) disconnected from X1A4A5*

Table 5.2 10 MHz Switch

1 MHz DIAL	X1A4A4 Pin Numbers (Function)			
	J (2^0 1 MHz)	H (2^1 1 MHz)	8 (2^2 1 MHz)	7 (2^3 1 MHz)
0	1	0	0	1
1	0	0	0	1
2	1	1	1	0
3	0	1	1	0
4	1	0	1	0
5	0	0	1	0
6	1	1	0	0
7	0	1	0	0
8	1	0	0	0
9	0	0	0	0

NOTE

1. *A "0" indicates short circuit to chassis ground*
2. *A "1" indicates open circuit to chassis ground*
3. *All readings taken with VHF Divider (1A4A4) disconnected from X1A4A4.*

Table 5.3 1 MHz Switch

100 kHz DIAL	X1A4A4 Pin Numbers (Function)			
	4 (2^3 100 kHz)	5 (2^2 100 kHz)	D (2^1 100 kHz)	E (2^0 100 kHz)
0	0	0	0	0
1	1	0	0	1
2	1	0	0	0
3	0	1	1	1
4	0	1	1	0
5	0	1	0	1
6	0	1	0	0
7	0	0	1	1
8	0	0	1	0
9	0	0	0	1

NOTE

1. *A "0" indicates short circuit to chassis ground*
2. *A "1" indicates open circuit to chassis ground*
3. *All readings taken with VHF Divider (1A4A4) disconnected from X1A4A4*

Table 5.4 100 kHz Switch

10 kHz DIAL	X1A4A2 Pin Numbers (Function)			
	R (2^3 10 kHz)	15 (2^2 10 kHz)	14 (2^1 10 kHz)	S (2^0 1 kHz)
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

NOTE

1. *A "0" indicates short circuit to chassis ground*
2. *A "1" indicates open circuit to chassis ground*
3. *All readings taken with Low Digit Generator (1A4A2) disconnected from X1A4A4*

Table 5.5 10 kHz Switch

1 kHz DIAL	X1A4A2 Pin Numbers (Function)			
	N (2^3 1 kHz)	13 (2^2 1 kHz)	12 (2^1 1 kHz)	P (2^0 1 kHz)
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

NOTE

1. *A "0" indicates short circuit to chassis ground*
2. *A "1" indicates open circuit to chassis ground*
3. *All readings taken with Low Digit Generator (1A4A2) disconnected from X1A4A2*

Table 5.6 1 kHz Switch

100 Hz DIAL	X1A4A2 Pin Numbers (Function)			
	L (2^3 100 Hz)	11 (2^2 100 Hz)	10 (2^1 100 Hz)	M (2^0 100 Hz)
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

NOTE

1. *A "0" indicates short circuit to chassis ground*
2. *A "1" indicates open circuit to chassis ground*
3. *All readings taken with Low Digit Generator (1A4A2) disconnected from X1A4A2*

Table 5.7 100 Hz Switch

I H.F. VCO (Low Digit Coarse Steering)

10 kHz DIAL	1A1A6P1 pin 9 VOLTS
0	3.50
1	3.85
2	4.15
3	4.55
4	4.95
5	5.40
6	5.90
7	6.40
8	7.00
9	7.70

II VHF VCO (VCO Coarse Steering)

1 MHz DIAL	1A1A6P1 pin 7 VOLTS
0	1.37
1	1.78
2	2.18
3	2.75
4	3.31
5	4.12
6	4.93
7	6.15
8	7.85
9	9.56

NOTE

All voltages above measured with 20,000 ohm/volt meter. Variations of ±5% are permissable

Table 5.8 Coarse Steering Voltage Readings

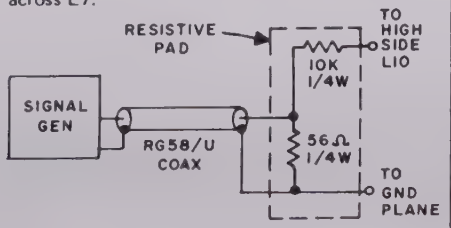
5.5.2 SYNTHESIZER SUBASSEMBLY TESTING AND ALIGNMENT PROCEDURES

The following paragraphs give the testing and alignment procedures for the synthesizer printed circuit board subassemblies. It is assumed that the defective subassembly has first been isolated either by substitution or by following the preliminary checks of Section 5.5.1.1.During the following tests, the printed circuit board being tested should be extended from the card basket using the extender card (Sunair # 5024-0030) supplied in the ancillary kit.

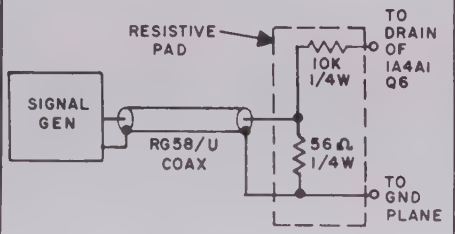
At any step in the procedure, if the required result cannot be obtained, refer to the schematic of the subassembly and make suitable voltage measurements to isolate the faulty component. When the faulty subassembly has been restored to operation the preliminary checks of Section 5.5.1.1 should be repeated to ensure full synthesizer operation.

5.5.2.1 SPECTRUM GENERATOR TESTING AND ALIGNMENT

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1	20 MHz ref. alignment and test	Oscilloscope probe at 1A4A1 pin 1. Connect frequency counter to Vertical Ampl. output of oscilloscope.	Tune L2, L3 & L4 for maximum output. **NOTE** *Adjustments interact and must be repeated until no further increase in output can be obtained.*	Minimum output of 300 mv p-p (sine wave) on oscilloscope. Frequency of 20 MHz ±20 Hz on Frequency counter. **NOTE** *If proper output cannot be obtained, refer to the schematic and check U1, U2, U3 and their associated circuitry.*
2	1 kHz ref. output	Oscilloscope probe on 1A4A1 pin 18	Consult schematic and check waveform	Pulse with following parameters: Rep. rate= 1 millisecond Duty ratio=0.2 Logical "0" level: less than 0.6V Logical "1" level: greater than 2.2V
3	100 kHz Ref. output	Oscilloscope probe on 1A4A1 pin 17	Consult schematic and check waveform	Pulse with following parameters: Rep. rate=10 microseconds Duty ratio=0.2 Logical "0" level: less than 0.6V Logical "1" level: greater than 2.2V

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4a	21 MHz Ref. alignment and test	RF voltmeter with unterminated tip on 1A4A1 pin 4. Connect signal generator as shown below. Set generator frequency to 21.00 MHz using Frequency Counter. Temporarily short jumper between U8 pin 2 and ground plane of printed circuit board. Similarly solder short jumper across L7. 	Set generator level to 250 mv RMS Tune L8, L9 & L10 for maximum output on RF voltmeter. **NOTE** *Adjustments interact and must be repeated until no further increase in output can be obtained.* Tune L10 for maximum output on RF voltmeter	
4b	21 MHz Ref. alignment and test	Same as 4a above except remove 10K resistor from L10 and connect to high side of L9	Tune L9 for maximum output. Repeak L10 for maximum output. Repeat tuning of L9 and L10 until no further output can be obtained	
4c	21 MHz Ref. alignment and test	Same as 4a above except remove 10K resistor from L10 and connect to high side of L8.	Tune L8, L9 and L10 for maximum output. Repeat tuning, in sequence, until no further output can be obtained.	
4d	21 MHz Ref. alignment and test	Leave RF voltmeter connected as in step 4a above. Disconnect the (2) jumpers and resistive pad network added in step 4a.	Carefully repeak L8, L9 and L10 for maximum output. Repeat tuning, in sequence, until no further output can be obtained	Meter indication of 85 mv RMS minimum, when tuning is complete. **NOTE** *If proper output cannot be obtained, refer to schematic and check Q1, Q2, and U8 and their associated circuitry. Also check CR4 thru CR7 and associated circuitry.*
5a	3rd L.O. (10.5 MHz Ref.) output	Connect RF voltmeter to 1A4A1 pin 13. Connect oscilloscope to U10 pin 8.	Place MODE switch on front panel in USB position. Refer to schematic and check waveform at U10 pin 8. Disconnect oscilloscope.	a) Proper oscilloscope waveform. b) RF voltmeter indication of 100 mv RMS minimum.
5b	3rd L.O. (10.5 MHz Ref.) output	Same as 5a above	Place MODE switch in AM position	RF voltmeter reading decreases at least 20 dB from that obtained in 5a above

5.5.2.1 SPECTRUM GENERATOR TESTING AND ALIGNMENT (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
6a	17 MHz Ref. alignment and test	RF voltmeter with unterminated tip on 1A4A1 pin 6. Temporarily solder a short jumper between gate # 1 of Q6 and the ground plane of the printed circuit board. **NOTE** *Gate #1 is the junction of C56, C61 and R50.* Connect the signal generator as shown below. Set generator frequency to 17.000 MHz (using the frequency counter) and set its level to 250 mv RMS.  	Tune L16 and L17 for maximum output on the RF voltmeter. **NOTE** *Adjustments interact and must be repeated until no further increase in output can be obtained.*	
6b	17 MHz Ref. alignment and test	Leave RF voltmeter connected as in 6a above. Disconnect resistive pad and jumper.	Tune L14 for maximum output on the RF voltmeter. Carefully repeak L16 and L17 for maximum output.	Minimum output level of 90 mv RMS after tuning is completed **NOTE** *If proper output cannot be obtained, refer to the schematic and check Q5, Q6, Q7, Q8, and their associated circuitry.*

5.5.2.2 LOW DIGIT GENERATOR (1A4A2)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1	17 MHz Ref.	Connect RF voltmeter to 1A4A2 pin C	Check RF voltmeter reading	Reading greater than 100 mv RMS. If out of specification, check C28, L9 and R21
2	1 kHz Ref.	Connect oscilloscope to 1A4A2 pin 18	Display waveform on scope	Pulse present with the following parameters: rep. rate=1 msec. Duty ratio=0.2 Logical "0" level: less than 0.6V Logical "1" level: greater than 2.2V If out of specification, check U2 and associated circuitry
3	Phase Lock	Connect oscilloscope to 1A4A2 pin 1. Connect vertical Ampl. output of oscilloscope to frequency counter. Connect V.O.M. to TP3.	Set 10 kHz, 1 kHz and 100 Hz frequency dials on front panel to "0"	V.O.M. should indicate approximately 1.5V. **NOTE** *If V.O.M. reads approximately 0.8V or 5V, this is an "out of phase lock" indication. Check:* *a) Voltage at TP1(see schematic) if incorrect, check CR5, Q2 and associated circuitry* *b) Refer to schematic and check waveform at TP2. If no signal is present, check Q1, U1 and associated circuitry* *c) Refer to schematic and check waveforms at U7, U8, U9, U10, U11, and U2.* *d) If the waveform at pin 1 of U7A deviates from the correct waveform on the schematic, check U6, Q3 and associated circuitry.* *If "out of Phase Lock" condition does not exist proceed to Step 4.*

5.5.2.2 LOW DIGIT GENERATOR (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4a	Output frequency	Same as Step 3 above	Measure output frequency	Output frequency of 1.5000 MHz ±2 Hz. If out of tolerance: a) Refer to tables 5.9, 5.10, 5.11 and check 10 kHz, 1 kHz and 100 Hz preset lines. b) Refer to schematic and check waveforms at U3, U4, U7, U8, U9, U10 and U11
4b	Output frequency	Same as Step 3 above	Set 1 kHz and 100 Hz dials at "5"	Output frequency of 1.5055 MHz ±2 Hz. V.O.M. indication of 1.95 ± 0.25V. **NOTE** *a) If V.O.M. indication is out of tolerance but frequency is correct, procede to step 5 and align VCO (Q1).* *b) If both frequency and V.O.M. readings are out of tolerance, refer to schematic and check U3, U4, U8, U9 and associated circuitry.*
4c	Output frequency	Same as Step 3 above	Leave 1 kHz and 100 Hz dials set at "0". Set 10 kHz dial at 9.	Output frequency of 1.5955 MHz ±2 Hz V.O.M. indication of 1.95 ± 0.25V. **NOTE** *a) If V.O.M. indication is out of tolerance but frequency is correct, procede to Step 6 and align VCO (Q1)* *b) If both frequency and V.O.M. readings are out of tolerance, refer to schematic and check U10 and associated circuitry.*

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4d	Output frequency	Same as Step 3 above	Follow the table below and check for required frequencies	

10 kHz DIAL	1 kHz DIAL	100 Hz DIAL	FREQUENCY (+2 Hz)
0	0	1	1.5001 MHz
0	0	2	1.5002 MHz
0	0	3	1.5003 MHz
0	0	4	1.5004 MHz
0	0	5	1.5005 MHz
0	0	6	1.5006 MHz
0	0	7	1.5007 MHz
0	0	8	1.5008 MHz
0	0	9	1.5009 MHz

If the required frequencies cannot be obtained, refer to schematic and check U8.

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4e	Output frequency	Same as Step 3 above	Follow the table below:	

10 kHz DIAL	1 kHz DIAL	100 Hz DIAL	FREQUENCY (+2 Hz)
0	1	0	1.5010 MHz
0	2	0	1.5020 MHz
0	3	0	1.5030 MHz
0	4	0	1.5040 MHz
0	5	0	1.5050 MHz
0	6	0	1.5060 MHz
0	7	0	1.5070 MHz
0	8	0	1.5080 MHz
0	9	0	1.5090 MHz

If the required frequencies cannot be obtained, refer to schematic and check U9.

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4f	Output frequency	Same as Step 3 above	Follow the table below:	

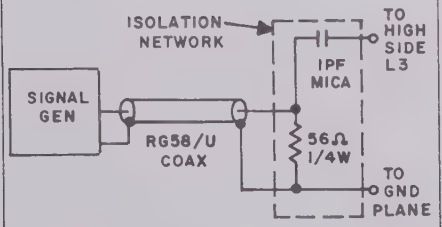
10 kHz DIAL	1 kHz DIAL	100 Hz DIAL	FREQUENCY (+2 Hz)
1	0	0	1.5100 MHz
2	0	0	1.5200 MHz
3	0	0	1.5300 MHz
4	0	0	1.5400 MHz
5	0	0	1.5500 MHz
6	0	0	1.5600 MHz
7	0	0	1.5700 MHz
8	0	0	1.5800 MHz
9	0	0	1.5900 MHz

See Note on following page.

5.5.2.2 LOW DIGIT GENERATOR (CONT'D)

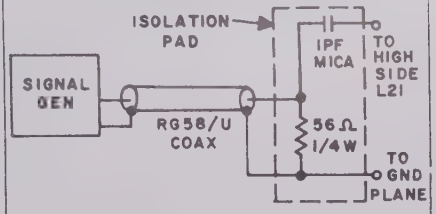
STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
				NOTE *If the required frequencies cannot be obtained, refer to schematic and check U10.*
5a	Output Level	Same as Step 3 above	Set 10 kHz, 1 kHz and 100 Hz dials to "0"	Output level of 200 mv p-p minimum.
5b	Output Level	Same as Step 3 above	Set 10 kHz, 1 kHz and 100 Hz dials to "9"	Output level of 200 mv p-p minimum.
				NOTE *If the required results cannot be obtained in Steps 5a and 5b above, refer to schematic and check Q5, Q6, U5 and associated circuitry.*
			NOTE *The alignment of the VCO, detailed in Step 6 below, should only be necessary if a component has been replaced in the voltage controlled oscillator (VCO) circuit (Q1). All other causes of improper operation should first be checked before proceeding with the alignment.*	
6a	VCO alignment	Same as Step 3 above	Set 1 kHz and 10 kHz dials to "5"; Set 10 kHz dial to "0". Tune L3 for a V.O.M. indication of 1.95 ±0.25 volts.	
6b	VCO alignment	Same as Step 3 above	Leave 1 kHz and 100 Hz dials set at "5". Tune C8 for a V.O.M. indication of 1.95 ±0.25 volts.	
6c	VCO alignment	Same as Step 3 above	Repeat 6a and 6b until required performance is obtained.	When tracking is complete, the V.O.M. should read 1.95 ±0.25 volts at both settings of the 10 kHz dial.

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1	21 MHz Ampl. alignment and test	Oscilloscope probe on TP4.	Place front panel VFO control in "IN" position. Tune L13 for maximum output.	Sine wave, 800 mv p-p min. rep. rate=47.6 nsec. **NOTE** *If required output cannot be obtained, refer to schematic and check U1 and associated circuitry.*
2a	VFO alignment and test	Same as step 1 above. Except also connect V.O.M. to 1A4A3 pin A. Connect Frequency Counter to Vertical Ampl. output of oscilloscope.	Pull OUT front panel VFO control. Rotate VFO until a reading of 7.6V is obtained on the V.O.M. Tune L23 until the VFO circuit begins to oscillate. Carefully rock the adjustment of L23 back and forth to center the tuning in the middle of the oscillation range.	
2b	VFO alignment (cont'd)	same as 2a above.	Adjust L22 for a frequency counter reading of 21.0000 MHz ±100 Hz. If this frequency cannot be obtained within the adjustment range of L22, slight adjustment of L23 is permissible to obtain the correct frequency.	Frequency counter reading of 21.0000 MHz ±100 Hz. Oscilloscope should indicate a sine wave, 700 mv p-p minimum amplitude.
2c	VFO alignment (con'd)	same as 2a above.	Rotate VFO control over its complete range. When the test is complete, place the VFO control in the "IN" position.	Oscilloscope amplitude should remain greater than 700 mv p-p. The Frequency should varv. as a minimum between 20.995 and 21.005 MHz. **NOTE** *If the required results cannot be obtained, refer to the schematic and check Q1, Q3, U2 and their associated circuitry. If the VFO cannot be aligned on frequency, VFO crystal, Y1, should be replaced.*
3a	19.45 MHz Ampl.	Connect RF voltmeter to U3 pin 6. Temporarily unplug the Low Digit Generator, 1A4A2, from the mother board. Temporarily solder a short jumper from U1 pin 2 to the printed circuit board ground plane. Set the signal generator frequency to 19.45 MHz using the Frequency Counter. Set the generator level to 250 mv RMS and connect as shown above.	Tune L3 and L5 for max. RF voltmeter reading. As tuning progresses, reduce signal generator level to keep RF voltmeter reading below 100 mv RMS.	

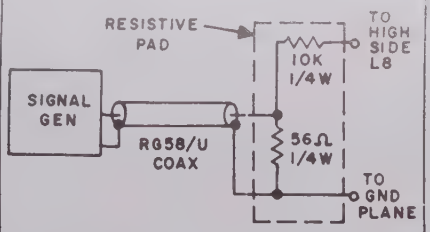


5.5.2.3 TRANSLATOR (1A4A3) (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
3b	19.45 MHz alignment (cont'd)	Disconnect 1 pf capacitor from high side L3 and connect to the high side of L2. Set the generator level to 250 mv RMS.	Tune L2 and L3 for max. RF voltmeter reading (adjustments interact). As the tuning progresses, reduce the generator level to keep the RF voltmeter reading below 100 mv RMS.	
3c	19.45 MHz alignment (cont'd)	Disconnect 1 pf capaciter fron high side of L2 and connect to the high side of L1. Set the generator level to 250 mv RMS.	Tune L1, L2 and L3 for max. RF voltmeter reading (adjustments interact). As the tuning progresses, reduce the generator level to keep the RF voltmeter reading below 100 mv RMS.	
3d	19.45 MHz alignment (cont'd)	Disconnect the isolation network signal generator and jumper wire added in 3a above. Plug the Low Digit Generator back into the mother board. Place the V.O.M. on the 10V D.C. range and connect to U3 pin 1. Connect the RF voltmeter to TP1. Terminate TP1 in a 50 ohm lead. **NOTE** *If a spectrum analyzer is available, the following tuneup and test procedure may be used in lieu of steps 5a through 5d*	Carefully repeak the slugs on L1, L2, L3 and L4. A point will be found where the voltage on the V.O.M. begins to increase. Tune the four inductors for max. V.O.M. indication. **NOTE** *The V.O.M. is monitoring the Automatic Gain control (AGC) voltage on this amplifier.*	When tuning is complete, the RF voltmeter should read approximately 7 mv RMS. **NOTE** *If the required performance cannot be obtained, consult the schematic and check U3, CR1 through CR4 and associated circuitry. Also check the output of the Low Digit Generator (consult schematic).*
	19.45 MHz Ampl. Alternate Alignment and test (using Spectrum Analyzer)	Connect spectrum analyzer to TP1 using 50 ohm coaxial cable. Set C.F. to 19.45 MHz and Scan width to 1 MHz/div. Set B.W. at 30 kHz. Set control for a Log display.	Tune L1, L2, L3 and L5 for max. output at 19.45 MHz on the spectrum analyzer. A point will be found where the output appears to level off and becomes insensitive to tuning adjustments. This is the onset of Automatic Gain control (AGC) action. Carefully adjust the above inductors for lowest levels of spurious responses. **NOTE** *The adjustments of L1, L2 and L3 interact and must be repeaked, in sequence for best spurious rejection and maximum output.*	Approximate output level of -30 dBm at 19.45 MHz. All spurious outputs down at least 40 db from the 19.45 MHz output (typically will be 50 db down).

STEP NO.	TEST	TES EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4	2nd L.O. alignment and test	Oscilloscope probe at 1A4A3 pin 11. Connect ground lead of probe to printed circuit board ground plane. Connect Vertical Ampl. output of oscilloscope to frequency counter.	Tune L17 until the circuit breaks into oscillation (as evidenced by a sudden increase in meter reading). Tune L25 for maximum meter indication. Carefully rock L17 back and forth to adjust the circuit to the center of its oscillation range.	Minimum output level of 300 mv p-p. Output frequency of 80.7500 MHz +4 kHz. **NOTE** *If required output cannot be obtained, refer to schematic and check Q7, Q9 and their associated circuitry. If the frequency is out of tolerance, replace crystal Y2.*
5a	100.75 MHz Bandpass Filter alignment and test	Temporarily solder a short jumper between Q8 gate #1 and the printed circuit board ground plane. Connect RF Voltmeter, terminated in a 50 ohm tip probe, to TP3. Set signal generator to 100.75 MHz using the frequency counter. Connect signal generator as shown below. Set generator level to 250 mv RMS. 	Tune L21 for maximum output on RF Voltmeter.	
5b	100.75 MHz Bandpass Filter alignment and test	Disconnect 1 pf capacitor from L21 and connect to the high side of L36	Tune L36 and L21 for maximum output on RF Voltmeter (adjustments interact and must be repeated until no further increase in output can be obtained).	
5c	100.75 MHz Bandpass Filter alignment and test	Disconnect 1 pf capacitor from L36 and connect to the high side of L20.	Tune L20, L36 and L21 for maximum output on RF Voltmeter (adjustments interact)	

5.5.2.3 TRANSLATOR (1A4A3) (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
5d	100.75 MHz Bandpass Filter alignment and test	Disconnect 1 pf capacitor, 56 ohm resistor and signal generator. Disconnect jumper added in Step 5a above.	Carefully repeak L20, L36 and L21 for maximum RF Voltmeter indication (adjustments interact). **NOTE** *If a spectrum analyzer is available, the following tuneup and test procedure may be used in lieu of steps 5a through 5d*	After tuning is complete, RF Voltmeter should read approximately 70 mv RMS.
	100.75 MHz Bandpass Filter alignment and test (alternate procedure for use with spectrum analyzer)	Connect spectrum analyzer to TP3. Set C.F. to 100.75 MHz, scan width to 5 MHz/div & bandwidth to 300 kHz. Set display mode to LOG.	Peak L20, L36 and L21 for maximum amplitude at 100.75 MHz (adjustments interact and must be repeated until no further output can be obtained).	After tuning is complete, output level on analyzer at 100.7500 MHz should be approximately 10 dBm. All spurious outputs should be at least 40 db below the 100.75 MHz output.
6a	81.25 MHz Bandpass Filter alignment and test	Temporarily solder a short jumper between Q11 gate 1 and the ground plane on the printed circuit board. Connect the RF voltmeter to TP2. Set the signal generator frequency to 81.25 MHz, using the frequency counter. Set the generator level at 250 mv RMS. Connect the signal generator as shown below.  	Tune L8 for maximum reading on RF voltmeter.	

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
6b	81.25 MHz B.P.F. alignment and test	Disconnect the 10K resistor from L8 and connect to the high side of L7.	Tune L7 and L8 for maximum RF voltmeter indication. **NOTE** *These adjustments interact and must be repeated until no further increase in output can be obtained.*	
6c	81.25 MHz B.P.F. alignment and test	Disconnect jumper, 10K resistor, 56 ohm resistor and signal generator added in step 6a.	Carefully repeak L7 and L8 for maximum indication on RF voltmeter (adjustments interact).	Indication of approximately 40 mv on RF voltmeter when tuning is complete. **NOTE** *If required output cannot be obtained, check Q11 and associated circuitry.*
7a	Output level adjustment	Connect oscilloscope probe to 1A4A3 pin 15 and connect ground lead of probe to the printed circuit board ground plane near pin 15.	Set front panel frequency dials (6) to 29.9999 MHz. Adjust R54 for a reading of 600 mv p-p on oscilloscope.	Oscilloscope display of 600 mv p-p, rep rate of 25 nsec (silghtly distorted sine wave)
7b	Output level adjustment	Same as 7a above.	Set front panel frequency dials to 00.0000 MHz	Oscilloscope display of 600 mv p-p minimum amplitude (distorted sine wave), rep rate of 100 nsec. **NOTE** *If required results cannot be obtained, refer to schematic and check: Q4, Q5, Q6, Q10 and associated circuitry. Also check the VCO (1A4A5) for proper output (refer to VCO schematic)*

5.5.2.4 VHF DIVIDER (1A4A4)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1a	100 kHz Dial test	Connect Signal Generator to X1A4A4 pin B using 50 ohm coaxial cable. Set generator level to 100 mv RMS.	Connect VOM to TP1. Set signal generator frequency to 9.9 MHz using the frequency counter. Temporarily unplug the Translator (1A4A3) from the card basket. Set 10 MHz, 1 MHz, and 100 kHz dials on front panel to "0"	VOM indication of greater than 4.5 volts
1b	100 kHz Dial test	Same as 1a above	Slowly increase generator frequency	At 10.0 MHz ±1 kHz, VOM indication should abruptly change to an indication of less than 0.9 volts.
				NOTE *If the proper indication in Steps 1a and 1b above cannot be obtained, refer to schematic and check all D.C. voltages and waveforms.*
1c	100 kHz Dial test	Same as 1a above	Follow the table below. In each case, the V.O.M. should indicate greater than 4.5 volts with the generator below the transition frequency and less than 0.9 volts above the transition frequency

10 MHz DIAL	1 MHz DIAL	100 kHz DIAL	Transition Frequency (±1 kHz)
0	0	1	10.1 MHz
0	0	2	10.2 MHz
0	0	3	10.3 MHz
0	0	4	10.4 MHz
0	0	5	10.5 MHz
0	0	6	10.6 MHz
0	0	7	10.7 MHz
0	0	8	10.8 MHz
0	0	9	10.9 MHz

NOTE

If the required results cannot be obtained, refer to schematic and check U3, U4, U5, U8, U9, U10, U13 and associated circuitry.

STEP NO.	TEST	TEST EQUIPMENT and TEST POINTS	PROCEDURE	REQUIRED PERFORMANCE
2	1MHz Dial test	Same as Step 1a above	Follow the table below. In each case the V.O.M. should indicate greater than 4.5V below the transition frequency and less than 0.9 volts above the transition frequency.	

10 MHz DIAL	1 MHz DIAL	100 kHz DIAL	Transition Frequency (±1 kHz)
0	1	0	11.0 MHz
0	2	0	12.0 MHz
0	3	0	13.0 MHz
0	4	0	14.0 MHz
0	5	0	15.0 MHz
0	6	0	16.0 MHz
0	7	0	17.0 MHz
0	8	0	18.0 MHz
0	9	0	19.0 MHz

NOTE

If required results cannot be obtained, refer to schematic and check U6, U5 and associated circuitry.

3	10 MHz Dial test	Same as Step 1a above	Follow the table below. In each case the V.O.M. should indicate greater than 4.5V below the transition frequency and less than 0.9V above the transition frequency	

10 MHz DIAL	1 MHz DIAL	100 kHz DIAL	Transition Frequency (±1 kHz)
1	0	0	20.0 MHz
2	0	0	30.0 MHz
2	9	9	39.9 MHz

NOTE

If required results cannot be obtained, refer to schematic and check U7, U8A, U8B, U13 and associated circuitry.

5.5.2.4 VHF DIVIDER (1A4A4) (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4a	Max. toggle frequency	Same as Step 1a above	Set 10 MHz dial at "2". Set 1 MHz and 100 kHz dals at "9". Set the signal generator frequency at 45 MHz. Set the generator level at 100 mv RMS.	V.O.M. should indicate less than 0.9V
4b	Max. toggle frequency	Same as Step 1a above	Slowly increse the generator frequency until the V.O.M. indicates greater than 4.5 volts.	Generator frequency greater than 50.0 MHz. **NOTE** *If the required results cannot be obtained, refer to schematic and check:* *a) Q1 through Q4* *b) Waveform at U2 pin 3* *If a) and b) above check o.k. U2 should be replaced.*

5.5.2.5 V.C.O. (1A4A5)

1a	BAND "0" alignment and test	Connect frequency counter to 1st L.O. out put (J1). Connect external +1.95 volts D.C. from power supply to X1A4A5 pin 4.	Set front panel 10 MHz frequency selector switch (1A1S1) to "0". Set 1 MHz frequency selector switch (1A1S2) to "0". Adjust L1 for for required performance.	Frequency indication of 91.75 ±-0.2 MHz. If no output present, proceed to steps 2 and 3. If steps 2 and 3 performance is acceptable, check Q3, Q6, and associated circuitry. If no output is obtained in all three steps, -1, 2, and 3- check buffer stage Q9, Q10.
1b	BAND "0" alignment and test	Same as 1a above.	Leave front panel 10 MHz frequency selector switch (1A1S1) set at "0". Set front panel 1 MHz frequency selector switch (1A1S2) to "9". Adjust C16 for required performance.	Frequency indication of 100.75 ± 0.75 MHz
1c	BAND "0" alignment and test	Same as 1a above.	Repeat steps 1a and 1b until both conditions are satisfied.	91.75 ±0.2 MHz 100.75 ± 0.75 MHz.
2a	BAND "1" alignment and test	Same as 1a above.	Set front panel 10 MHz frequency selector switch (1A1S1) to "1". Set front panel 1 MHz frequency selector switch (1A1S2) to "0". Adjust L4 for required performance.	Frequency indication of 101.75 ± 0.2 MHz. If no output present, but steps 1 and 3 are correct, check Q4, Q7, and associated circuitry.
2b	BAND "1" alignment and test	Same as 1a above.	Leave front panel 10 MHz frequency selector switch (1A1S1) set at "1". Set front panel 1 MHz frequency selector switch (1A1S2) to "9".	Frequency indication of 110.75 ± 0.75 MHz.
2c	BAND "1" alignment and test	Same as 1a above.	Repeat steps 2a and 2b until both conditions are satisfied.	101.75 ±0.2 MHz, 110.75 ±0.75 MHz.

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
3a	BAND "2" alignment and test	Same as 1a above.	Set front panel 10 MHz frequency selector switch (1A1S1) to "2". Set front panel 1 MHz frequency selector switch (1A1S2) to "0". Adjust L7 for required performance.	Frequency indication of 111.75 ± 0.2 MHz. If no output present, but steps 1 and 2 are correct, check Q5, Q8 and associated circuitry.
3b	BAND "2" alignment and test	Same as 1a above.	Leave front panel 10 MHz frequency selector switch (1A1S1) set at "2". Set front panel 1 MHz frequency selector switch (1A1S2) to "9" Adjust C38 for required performance.	Frequency indication of 120.75 ± 0.75 MHz.
3c	BAND "2" alignment and test	Same as 1a above.	Repeat steps 3a and 3b until both conditions are satisfied.	111.75 ± 0.2 MHz, 120.75 ±0.75 MHz.
4a	1st L.O. output level	Connect R.F. Voltmeter with 50 ohm BNC adapter to 1st L.O. output connector (J1). Connect external +1.95 volts D.C. from power supply to X1A4A5 pin 4. Tack solder 47 ohm 1/4 or 1/2 watt carbon resistor from X1A4A5 pin 2 to ground.	Set front panel 10 MHz frequency selector switch (1A1S1) to "1". Set front panel 1 MHz frequency selector switch (1A1S2) to "6". Adjust L12 (access hole near 1st L.O. output connector J1) for maximum level.	Reading greater than 100 mV rms (225 mV typical).
4b	1st L.O. output level	Same as 4a above.	Set front panel 10 MHz frequency selector switch (1A1S1) and 1 MHz frequency selector switch (1A1S2) to "0". Record this output level.	Reading greater than 100 mV RMS (225 mV typical).
4c	1st L.O. output level	Same as 4a above.	Set front panel 10 MHz frequency selector switch (1A1S1) to "2". Set front panel 1 MHz frequency selector switch (1A1S2) to "9". Record this output level.	Reading greater than 100 mV RMS (225 mV typical).
4d	1st L.O. output level	Same as 4a above.	If necessary, adjust L12 slightly so that the readings of steps 4a, b, and c are within 3 db of each other.	If any reading in steps 4a, b, or c is low, check buffer stage Q9, Q10 and associated circuitry.

5.5.2.5 VCO (1A4A5) (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
5a	1st L.O. output level to translator	Tack solder 47 ohm 1/4 or 1/2 watt carbon resistor from X1A4A5 pin 2 to ground. Connect open circuit probe tip from R.F. Voltmeter to X1A4A5 pin 2. Place a 50 ohm load on 1st L.O. output connector J1. Connect +1.95 volts D.C. from external power supply to X1A4A5 pin 4.	Set front panel 10 MHz frequency selector switch (1A1S1) to "0". Sequence the front panel 1 MHz frequency selector switch (1A1S2) from "0" through "9".	Reading should remain greater than 100 mV RMS (225 mV typical) in each position of 1A1S2. If proper output cannot be obtained, refer to schematic and check buffer stage Q11 and Q12 and associated circuitry.
5b	1st L.O. output level to translator	Same as 5a above.	Set front panel 10 MHz frequency selector switch (1A1S1) to "1". Sequence the 1 MHz frequency selector switch (1A1S2) from "0" through "9".	Reading should remain greater than 100 mV RMS (225 mV typical) in each position of 1A1S2.
5c	1st L.O. output level to translator	Same as 5a above.	Set front panel 10 MHz frequency selector switch (1A1S1) to "2". Sequence the 1 MHz frequency selector switch (1A1S2) from "0" through "9".	Reading should remain greater than 100 mV RMS (225 mV typical) in each position of 1A1S2.
6a	Logic Outputs	V.O.M. on X1A4A5 pin 17.	Front panel 10 MHz frequency selector switch (1A1S1) position: "0" "1" "2"	 less than 0.5 V.D.C. greater than 2.2 V.D.C. less than 0.5 V.D.C.
6b	Logic Outputs	V.O.M. on X1A4A5 pin 18.	Front panel 10 MHz frequency selector switch (1A1S1) position: "0" "1" "2"	 greater than 2.2 V.D.C. less than 0.5 V.D.C. less than 0.5 V.D.C. If these readings cannot be obtained, consult the schematic and check logic switches Q1, Q2, and associated circuitry.

5.6 RECEIVER/EXCITER BOARD ALIGNMENT

The following paragraphs provide alignment instructions for the Receiver/Exciter printed boards.

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
5.6.1 V.H.F. MIXER BOARD (1A3A1)				
1	1st IF alignment	Connect RF Signal Generator to Antenna connector 1A8J1 and set frequency for 16.0 MHz.	Remove VHF Mixer Board from RCVR/ Exciter card basket by grasping corners of board and pulling upward. Install extender card in slot for connector 1A3J1 and plug VHF mixer into extender card. Set Frequency switches at 16,0000. Mode switch at USB, and adjust RF gain Control so that "S" meter reads "S 9". Set RF generator level to 10 MV and adjust frequency until a tone of approximately 1 kHz is heard in the speaker. Adjust capacitors C41 and C44 for peak on the "S" meter. Next adjust Transformer T7 and T8 for peak on the "S"' meter. Recheck C44 and T7 for meter peak. Remove extender card and replace VHF mixer board into its connector in the card basket.	If no peaking is observed ckeck E24 and E18 on the RCVR/Exciter Mother board, using a high frequency oscilloscope to determine if 1st L.O. and 2nd L.O. are present (approximate OdBM). If not, check synthesizer sections 4.2 and 5.5. If 1st L.O. and 2nd L.O. are present, check outputs of Q5 and Q8 on VHF mixer board, then check Q2 and associated circuitry.
5.6.2 IF/FILTER BOARD (1A3A2)				
1	2nd IF alignment	Connect RF Signal Generator to Antenna connector 1A8J1, and set frequency for 16.0 MHz.	Remove IF/Filter board from RCVR/Exctr card basket by grasping corners of board and pulling upward. Install extender card in slot for connector 1A3J2, and plug IF/Filter board into extender card. Set frequency switches at 16,0000 mode switch at USB and adjust RF GAIN control so that "S" meter reads "S 9". Set RF Generator level to 10 MV and adjust frequency until a tone of approximately 1 kHz is heard in the speaker. Adjust inductors L3 and L4 for peak on the "S" meter. Remove Extender card and replace IF/Filter board in its connector in the card basket.	If no peak is observed, check U1 and U2 plus associated circuitry on IF/Filter board. Also check Q3 and associated circuitry.
5.6.3 SIDEBAND GENERATOR BOARD (1A3A3)				
1	BALANCED MODULATOR TUNING	Connect RF VTVM and dummy load to antenna connector, 1A8J1.	Remove sideband generator board from RCVR/ Exciter card basket by grasping corners of board and pulling upward. Install extender card in slot for connector 1A3J3, and plug sideband generator board into extender card. Turn potentiometer 1A3A3, R34, approximately 8 turns. CW. Turn XMIT GAIN full CCW and set mode switch to USB. Key transceiver with microphone and, observing RF VTVM, tune Transformer T1 for maximum output. Remove extender card and replace sideband generator board in its connector in the card basket. Repeat carrier null alignment per par. 5.4.6, step 4.	If no carrier output is observed, check E16 on RCVR/ Exciter mother board to determine if 3rd L.O. is present (approximately OdBM). If not, refer to synthesizer sections 4.2 and 5.5. If 3rd L.O. is present, check output of 1A3A3 Q1 and associated circuitry.

5.7 FAULT ANALYSIS TABLE

SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
Receiver inoperative, meter not illuminated.	a. Primary power fuse F1, F2 or (for DC operation) F3 not installed or open.	a. Replace fuse.
	b. +12VDC fuse (1A6A1 F2) open in power supply.	b. Replace fuse.
	c. Power cord defective or not connected.	c. Make continuity check of cable, replace or repair cable.
	d. Power supply defective.	d. Refer to sections 4.7 and 5.4.3. Repair or replace regulator board or entire power supply module if required.
No audio or background noise at speaker or phones jack. Meter indicates RF signal present.	a. 28VDC protective crowbar has operated.	a. Turn off main power. Wait 15 seconds and re-energize radio. If still no audio, check 28VDC power supply for short circuited ouput.
	b. Speaker switch at OFF or defective.	b. Check position of switch and make necessary continuity checks.
	c. Speaker driver board defective.	c. Refer to section 4.4.5. Repair or replace defective assembly.
	d. Amplifier 1A3A4 Q11 defective.	d. Replace defective transistor.
No audio or background noise at speaker in all modes. meter does not indicate, but is illuminated.	a. +5 VDC fuse open in power supply.	a. Replace fuse. If fuse blows again, check +5V line for short circuit.
	b. VHF mixer board defective.	b. Refer to section 4.4.2. Repair or replace defective assembly.
	c. IF/Filter board defective.	c. Refer to section 4.4.3. Repair or replace defective assembly.
	d. Audio board defective.	d. Refer to section 4.4.4. Repair or replace defective assembly.
	e. Synthesizer defective.	e. Refer to section 4.2. Repair or replace defective assembly.
AM mode normal, other modes inoperative.	a. 3rd L.O. injection absent at 1A3A4 audio board.	a. Make continuity test of cable. Repair or replace.
	o. Synthesizer defective.	b. Refer to section 4.2. Repair or replace defective assembly.
AM, or USB, or LSB, inoperative, other modes operative.	a. Mode switch defective.	a. Make continuity check. Repair or replace switch.
	b. IF/Filter board defective.	b. Check diode switches on IF/Filter board. Check filters. Repair or replace defective parts.
No audio at speaker. Meter at full scale.	a. RF GAIN control fully CCW or defective.	a. Adjust RF GAIN control CW. Replace defective component.
	b. Transistor 1A3A4 Q12 defective.	b. Replace defective component.
Distorted audio at speaker. Meter remains at full scale.	a. Transistor 1A3A4 Q4 defective.	a. Replace transistor.
Received signals weak in all modes "S" meter also low.	a. Filter module defective or does not channel.	a. Refer to section 4.8. Repair or replace defective component.
	b. VHF mixer board defective.	b. Refer to section 4.4.2. Repair or replace defective assembly.

SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
Received signals weak in all modes-Cont.	c. IF/Filter board defective.	c. Refer to section 4.4.3. Repair or replace defective assembly.
	d. Local oscillator injection levels low.	d. Refer to section 4.2. Repair or replace defective assembly.
	e. Coaxial cables defective.	e. Make continuity tests, repair or replace defective cable.
Transmitter will not key.	a. Defective microphone.	a. Repair or replace.
	b. 1A5K2 or 1A8K1 defective.	b. Replace defective part.
	c. Jumper between pins n and p missing on accessory socket-1A8J4.	c. Replace jumper.
Transmitter keys but no output or output low in all modes.	a. Defective sideband generator board.	a. Refer to section 4.5.2. Repair or replace defective assembly.
	b. Defective IF/Filter board.	b. Refer to section 4.5.3. Repair or replace defective assembly.
	c. Defective VHF mixer board.	c. Refer to section 4.5.4. Repair or replace defective assembly.
	d. Defective or disconnected coaxial cables.	d. Check all coaxial fittings. Perform continuity test on coaxial cables and repair or replace.
	e. Defective RF power amplifier module.	e. Refer to sections 4.6 and 5.8.4. Repair or replace defective assembly.
	f. Defective filter module.	f. Refer to section 4.8. Repair or replace defective assembly.
Transmitter keys, output ok in CW, carrier ok in AM, but no modulation or output in USB or LSB.	a. Defective microphone.	a. Repair or replace.
	b. Broken or shorted wire between microphone and RCVR/Exciter mother board.	b. Perform continuity check. Repair broken wire.
Transmitter keys, output ok in CW, USB, LSB. No carrier in AM.	a. Defective ACC.	a. Check 1A3A3 Q2, Q3, Q5 and associated circuitry.
Too much carrier in AM, can not adjust.	a. Defective ACC.	a. Check 1A3A3 Q2, Q3, and Q5 and associated circuitry.
	b. Defective ACC potentiometer.	b. Replace 1A3A3 R18.
	c. Defective ACC detector.	c. Check ACC detector on 1A5A4. Repair and replace defective component.
SSB or CW output too high or too low.	a. ALC control adjusted incorrectly.	a. Adjust 1A3A3 R55 in CW mode for 71 VRMS into 50 ohms at 16.0000 MHz.
AM Carrier level too high or too low.	a. ACC control adjusted incorrectly.	a. Adjust 1A3A3 R18 in AM mode for 42 VRMS.

5.7 FAULT ANALYSIS TABLE (CONT'D)

SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
AM operation or coupler tune causes 28VDC crowbar to act, disabling 28V.	a. Inoperative or defective current ALC loop.	a. Check transistor 1A7Q7 and associated circuitry. Check 1A3A1 Q4 and associated circuitry. Continuity test cable between 1A3A1 P1 U and 1A7J3 B.
No CW or side tone.	a. Defective or inoperative tone oscillator.	a. Check 1A3A3 Q6, Q7, Q8, and associated circuitry.
Sidetone ok. but XMTR does not key in CW mode	a. Defective CW keying transistor.	a. Check 1A3A3 Q12, CR7, CR8, and associated circuitry.
	b. Defective T/R relay.	b. Check relays 1A8K1 and 1A5K2.
Unit inoperative with DC main power applied.	a. Main source polarity reversed.	a. Switch + and — leads to DC source.
	b. DC module not installed or installed improperly.	b. Refer to section 2.6.3.
	c. DC module defective.	c. Refer to section 4.7.2 and repair or replace defective module.
Power output ok, but no meter indication, meter ok on receive.	a. Inoperative or defective output detector circuit.	a. Check detector 1A5CR5 and associated circuitry.
	b. Broken wire in cable line.	b. Make continuity checks and repair.
ANTENNA COUPLER PROBLEMS		
Power output ok, but no meter indication, meter ok on receive.	a. Defective or disconnected coaxial cable between transmitter and coupler.	a. Continuity test and repair or replace.
	b. Defective or inoperative detector in coupler.	b. Repair or replace defective device. Consult coupler handbook.
	c. Broken wire in cabling.	c. Continuity test and repair.
Coupler does not tune - any control.	a. +28VDC missing in coupler.	a. Continuity test and repair.
	b. Coupler tune line not grounded in coupler tune mode.	b. Check mode switch wiring and continuity of cable and repair.
	c. Mode switch is not in coupler tune position.	c. Check position of mode switch.

SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
SECURE CHANNEL FRONT PANEL PROBLEMS		
Incorrect Band Selection	a. Defective Band Prom.	a. Check 1A1A6 U21 per Truth Table **5.12**. Replace defective component.
	b. Defective Output Drivers.	b. Check 1A1A6 U9 thru U12 and associated circuitry for proper operation on each band. Replace defective component.
Incorrect VCO Steering	a. Defective BCD to Decimal Decoders.	a. Check 1A1A6 U28 and U29 per Truth Table **5.11**. Replace defective component.
	b. Defective Voltage Divider components.	b. Measure HF and VHF steering voltages per Table 5.8. Check transistor-resistor network associated with improper voltage reading at Frequency Selector switch position. Replace defective component.
Will not load RCV frequencies.	a. Defective Memory interface circuitry.	a. Check operation of 1A1A6 U26A, U26B, U16, and 1A1A7 U10C as Load RCV pushbutton is actuated to isolate defective device. Replace defective component.
Will not Load XMT frequencies.	a. Defective Memory interface circuitry.	a. Check operation of 1A1A6 U26C, U26D, U3C, U17, and 1A1A7 U10F as Load XMT pushbutton is actuated to isolate defective device. Replace defective component.
Frequencies load into incorrect channel locations.	a. Defective Memory Address drivers.	a. Check input and output levels of 1A1A7 U22, U26B, U10E and U10F. [illegible] put and output levels should be the same. Replace [illegible].
	b. Defective Memory Address converters.	b. Check for proper operation of 1A1A7 U1 and U2 by using Table **5.10** for correct logic levels at Address inputs. If incorrect, replace U1 and U2.
Master Clear inoperative	a. Defective Counter-Oscillator circuitry.	a. Measure Ram Data Input pins on 1A1A7 U3A, U4A, U5A, U6A, U7A and U8A after releasing Master Clear pushbutton. Logic levels should be briefly low ("0" state). Measure outputs levels of U4B, U8A, U6D, U13 and U22. Refer to section **4.3.2.8** and use Timing Waveforms **FIG. 5.1B**. Replace defective component.

5.7 FAULT ANALYSIS TABLE (CONT'D)

SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
Secure Mode inoperative	a. Defective Display Blanking circuitry.	a. Check logic levels on 1A1A6 U1B, U14D and U25D. Refer to section **4.3.2.7.** Replace defective component.
Short Battery Life	a. Excessive Memory Standby Current drain.	a. Measure voltage across 1A1A7 R17 thru R22 with transceiver turned off. Readings should be less than 100uV each. Replace defective Ram.
	b. Battery switching circuitry does not operate.	b. Check for Unreg. Voltage at 1A1A6P2-73. Check devices 1A1A6 CR12, **Q15**, CR7 for proper operation. Refer to section **4.3.2.4.** Replace defective components.
Low Battery Light on with fresh batteries installed.	a. Defective Power Clear circuit.	a. Check components 1A1A7 R24, C9, U19F, U19E and U10B for proper operation. Refer to section. **4.3.5.7.** Replace defective component.
	b. Faultly Low Battery Detection Circuitry.	b. Check components Q15, U6B, U15B, U7C, U15C, U4A and U1A for proper operation. Refer to section **4.3.2.5** and Timing Waveforms Fig. 5.1A . Replace defective Component.
Synthesizer does not program properly	a. Defective Synthesizer Programming Converter.	a. Check output levels of components U9A, U19A, U19B, U19C, U19D, U20A, U20B, U20D, U21, U31 and U32. Refer to Table 5.9 for the **10 MHZ**, 1 MHZ and 100KHZ Frequency Coding. Replace defective component.

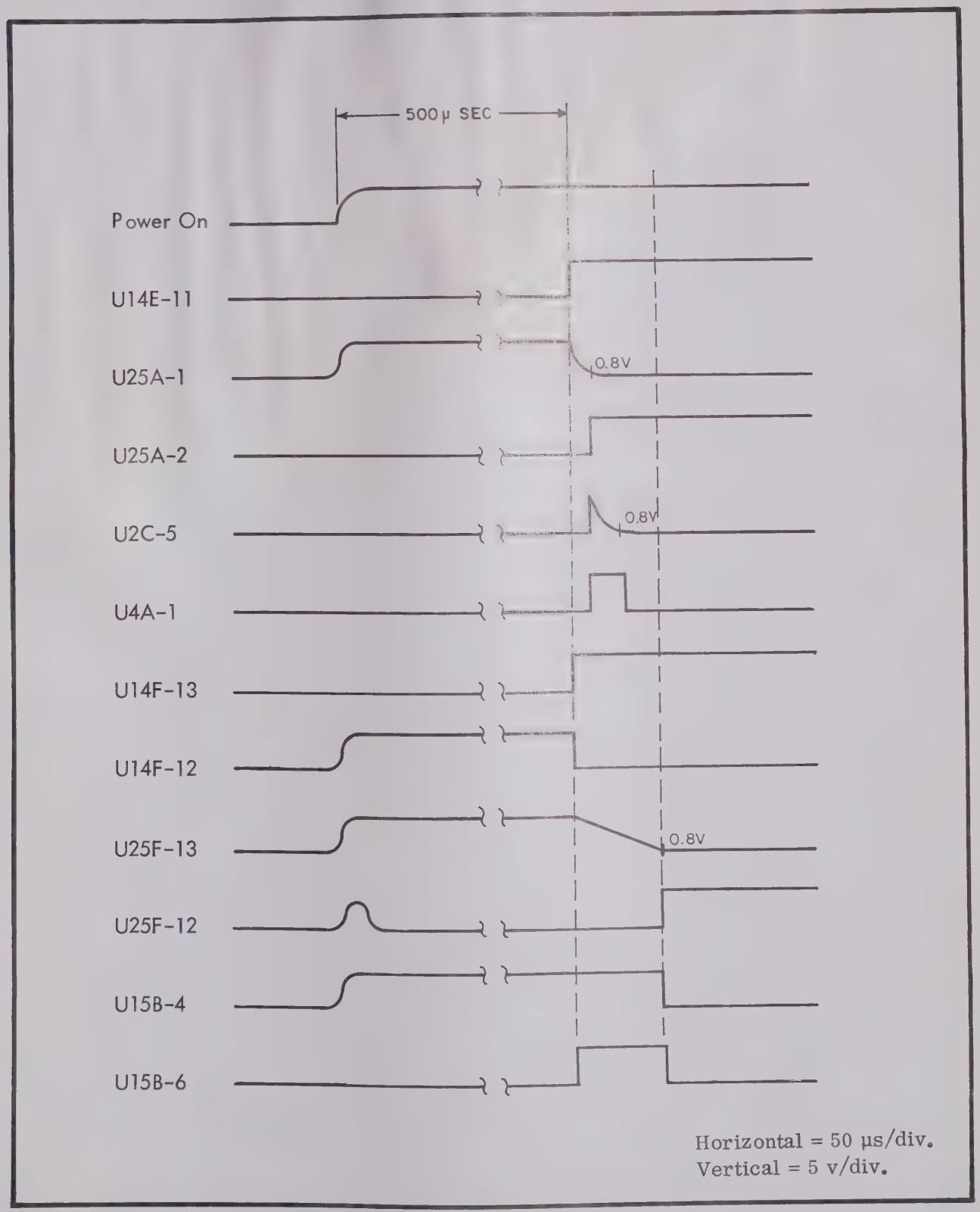
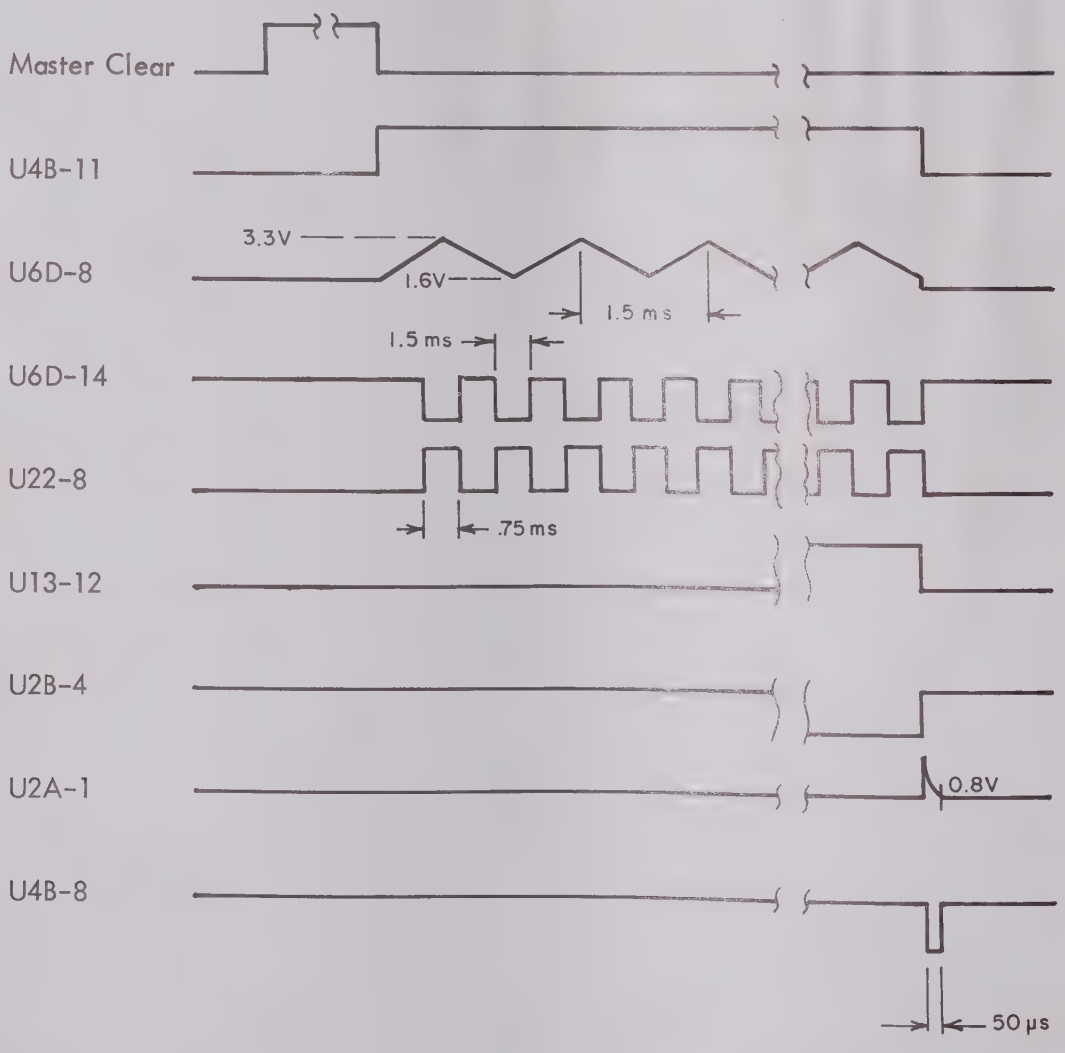


Figure 5.1A Power Clear-Low Battery Timing Waveforms



Horizontal = 750 µsec/div.
Vertical = 5 volts/div

Figure 5.1B Master Clear Waveforms

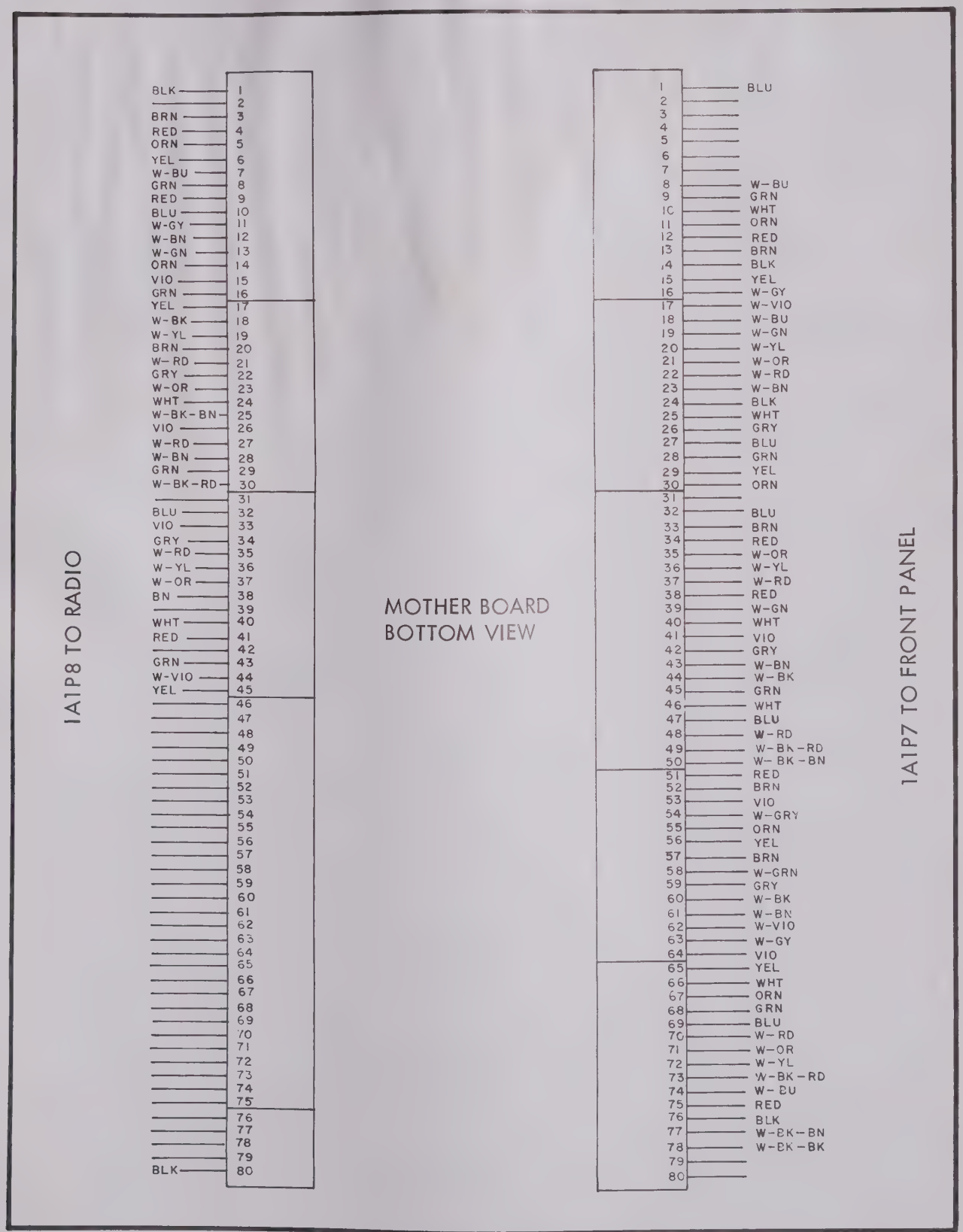


Figure 5.1C GSB-900SC Front Panel to Radio Mother Board Connector Strip

5.8 MODULE REMOVAL

This section provides special test information and module removal instructions.

5.8.1 REMOVAL OF FILTER MODULE-1A5

5.8.1.1 Disconnect all cables from the motor control board (1 power connector, 3 coax connectors).

5.8.1.2 Turn transceiver upside down and remove four screws holding filter module.

5.8.1.3 To remove filter assembly from its case, remove four flathead screws around case periphery and pull assembly out from the case.

5.8.2 FRONT PANEL REMOVAL

To remove the front panel from the transceiver:

a) Remove bottom covers from the RCVR/EXCTR and SYNTH compartments.
b) Carefully disconnect the mother board connectors (1A1P2 on the RCVR/EXCTR side and 1A1P3 on the SYNTH side).
c) Disconnect the two connectors that plug into the top of the transceiver chassis (1A1P1 and 1A1P6).
d) Remove the three rear screws from each front panel away from the rest of the unit.
e) To replace the front panel, reverse the above procedure, being careful not to kink, break, or pinch wires, particularly around the digital switches.

5.8.2.1 MEMORY SYSTEM MOTHER BOARD ASSEMBLY 1A1A5

The Memory Board and Band Steering Board are interfaced to the radio and front panel by a printed circuit Mother Board using connectors 1A1P7 and 1A1P8. Connections 1A1P7, pin 1-80, and 1A1P8, pins 1-80, are each made to the Mother Board by means of several connector strips of different sizes. Correct placement of the strips and wire color coding is shown in Figure 5.1C. Care should be used in connecting the strips to the Mother Board so that pin damage does not result. In the event that the Mother Board Assembly requires removal, note that proper orientation of the board is labeled to show which connector should face the Radio and which connector should face the Front Panel.

5.8.2.2 FREQUENCY CODING

NOTE

To test frequency coding, the FREQUENCY MODE KEY-LOCK SWITCH must be in the NORMAL position. "0" indicates ground, "1" indicates open circuit.

10 MHz Dial	1A1A7P2 Pin 16	Pin 8	Pin 14	1A1A2 U1 Pin 1	Pin 7
0	0	1	1	0	0
1	1	0	1	0	1
2	1	1	0	1	0

Table 5.9 Frequency Coding

1 MHz Dial	1A1A7P2				1A1A2 U2			
	Pin 18	Pin 20	Pin 24	Pin 26	Pin 6	Pin 2	Pin 1	Pin 7
0	1	0	0	1	0	0	0	0
1	1	0	0	0	0	0	0	1
2	0	1	1	1	0	0	1	0
3	0	1	1	0	0	0	1	1
4	0	1	0	1	0	1	0	0
5	0	1	0	0	0	1	0	1
6	0	0	1	1	0	1	1	0
7	0	0	1	0	0	1	1	1
8	0	0	0	1	1	0	0	0
9	0	0	0	0	1	0	0	1

100 kHz Dial	1A1A7P2				1A1A2 U3			
	Pin 6	Pin 4	Pin 10	Pin 12	Pin 6	Pin 2	Pin 1	Pin 7
0	0	0	0	0	0	0	0	0
1	1	0	0	1	0	0	0	1
2	1	0	0	0	0	0	1	0
3	0	1	1	1	0	0	1	1
4	0	1	1	0	0	1	0	0
5	0	1	0	1	0	1	0	1
6	0	1	0	0	0	1	1	0
7	0	0	1	1	0	1	1	1
8	0	0	1	0	1	0	0	0
9	0	0	0	1	1	0	0	1

Table 5.9 Frequency Coding (Con't.)

10 kHZ Dial	1A1A7P2				1A1A2 U4			
	Pin 43	Pin 41	Pin 39	Pin 27	Pin 6	Pin 2	Pin 1	Pin 7
0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	1
2	0	0	1	0	0	0	1	0
3	0	0	1	1	0	0	1	1
4	0	1	0	0	0	1	0	0
5	0	1	0	1	0	1	0	1
6	0	1	1	0	0	1	1	0
7	0	1	1	1	0	1	1	1
8	1	0	0	0	1	0	0	0
9	1	0	0	1	1	0	0	1

1 kHz Dial	1A1A7P2				1A1A2 U5			
	Pin 51	Pin 49	Pin 47	Pin 45	Pin 6	Pin 2	Pin 1	Pin 7
0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	1
2	0	0	1	0	0	0	1	0
3	0	0	1	1	0	0	1	1
4	0	1	0	0	0	1	0	0
5	0	1	0	1	0	1	0	1
6	0	1	1	0	0	1	1	0
7	0	1	1	1	0	1	1	1
8	1	0	0	0	1	0	0	0
9	1	0	0	1	1	0	0	1

Table 5.9 Frequency Coding (Con't.)

100 Hz Dial	1A1A7P2				1A1A2 U6			
	Pin 59	Pin 57	Pin 55	Pin 53	Pin 6	Pin 2	Pin 1	Pin 7
0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	1
2	0	0	1	0	0	0	1	0
3	0	0	1	1	0	0	1	1
4	0	1	0	0	0	1	0	0
5	0	1	0	1	0	1	0	1
6	0	1	1	0	0	1	1	0
7	0	1	1	1	0	1	1	1
8	1	0	0	0	1	0	0	0
9	1	0	0	1	1	0	0	1

Table 5.9 Frequency Coding (Con't.)

5.8.3 POWER SUPPLY REMOVAL

5.8.3.1 Remove four screws securing top cover of power supply.

5.8.3.2 To remove Regulator board (1A6A1), take out four large screws holding two capacitors (1A6A1-C5 and C9) as shown in Figure 5.2. Next, unfasten two hold down screws and pull the board forward and slightly upward to remove.

5.8.3.3 To take out the entire power supply from the chassis, remove only the screws, shown in Figure 5.2, from the RIGHT SIDE PANEL. DO NOT remove the cover clamps and their associated hardware.
Unplug the connector, 1A6P1, from the chassis as illustrated in Figure 5.3. Remove the four screws holding the regulator heat sink and then unscrew the transistor 1A6Q101 from the heat sink. If a D.C. Inverter is installed, disconnect its leads from terminal board 1A6TB2. Next remove the screws holding the Power Supply module to chassis. To reach the forward screws it will be necessary to pull out the two rear boards (1A4A1 and 1A4A2) from the synthesizer module. The remaining four screws at the rear of the chassis are easily accessable.

5.8.3.4 When reinstalling capacitors 1A6A1C5 and C9, on the regulator board, make sure polarity is correct (polarity is marked on regulator board 1A6A1). The four capacitor mounting screws should be tight against their lock washers but not so tight as to strip the internal threads in the capacitor.

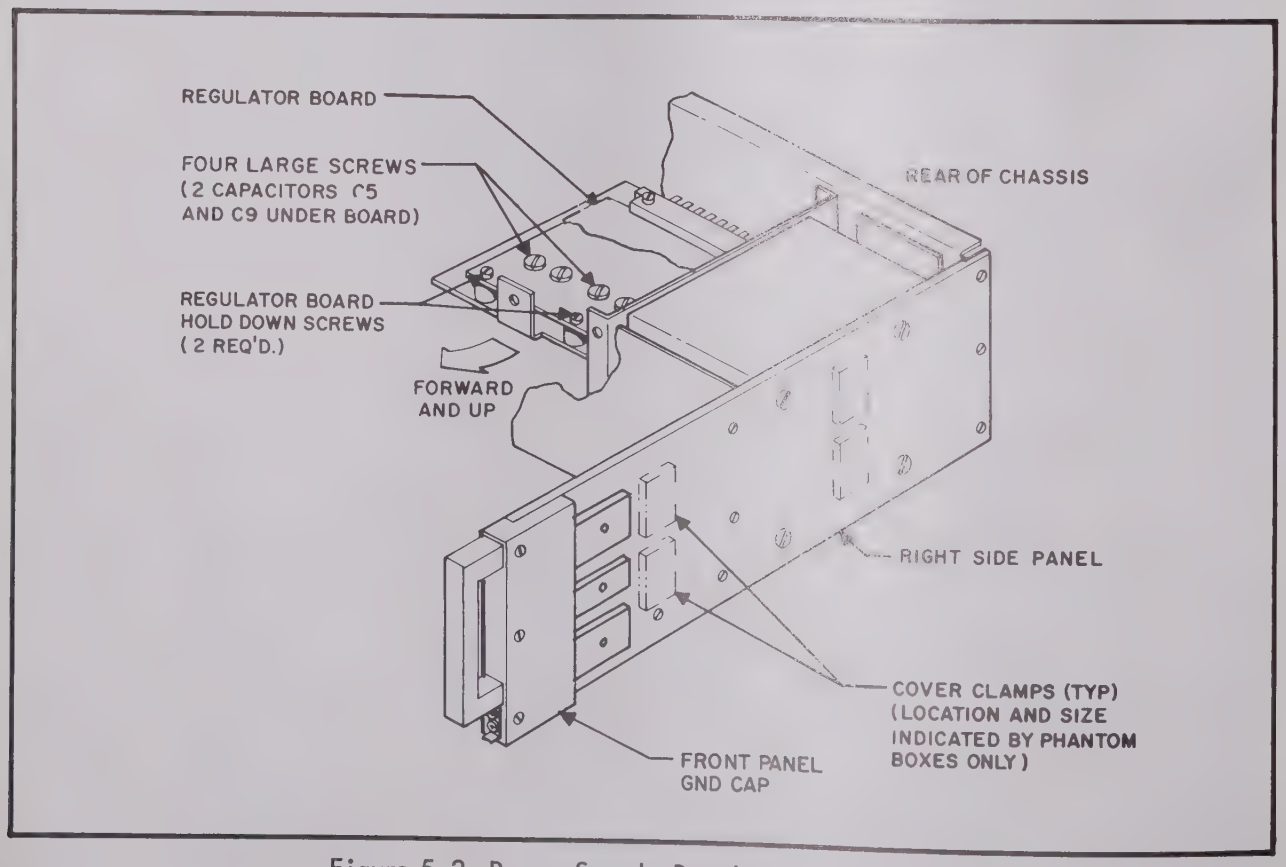

REGULATOR BOARD
FOUR LARGE SCREWS (2 CAPACITORS C5 AND C9 UNDER BOARD)
REGULATOR BOARD HOLD DOWN SCREWS (2 REQ'D.)
FORWARD AND UP
REAR OF CHASSIS
RIGHT SIDE PANEL
COVER CLAMPS (TYP) (LOCATION AND SIZE INDICATED BY PHANTOM BOXES ONLY)
FRONT PANEL GND CAP

Figure 5.2 Power Supply Regulator Board (1A6A1)

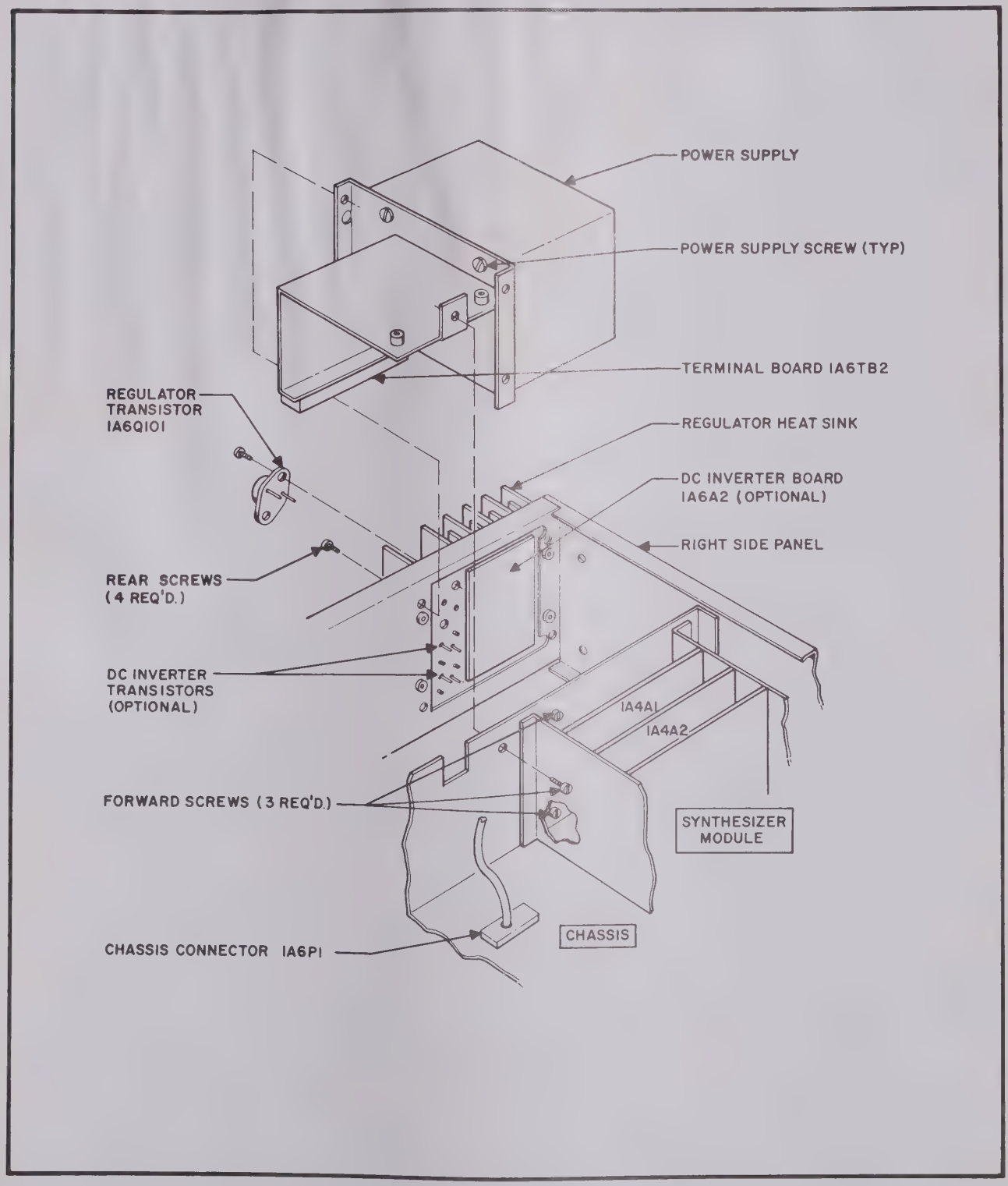


Figure 5.3 Power Supply Removal (1A6)

5.8.4 RF POWER AMPLIFIER REMOVAL AND SERVICING

When a power amplifier failure is suspected, first test the exciter output into 50 ohms at connector 1A3P3 to insure that it is capable of providing approximately 4 volts peak to peak undistorted output on SSB (using hand microphone).

5.8.4.1 To remove power amplifier, disconnect connectors 1A7J1, J2, and J3. Remove the four screws holding heat sink assembly to transceiver rear panel. Power amplifier assembly removes from the rear of the transceiver.

5.8.4.2 For servicing the power amplifier, it is desirable to use an external power source capable of 28VDC at 12 amperes, continuously variable from 0 to 28 VDC. If such a power source is not available, the transceiver power supply can be used. A typical test set up is shown in Figure 5.4.

CAUTION

When using a HP 606 or other RF signal generator to test the power amplifier, extreme caution should be exercised to prevent overdriving the unit and needlessly destroying transistors. Remember, the protection circuits are disconnected during tests of this type.

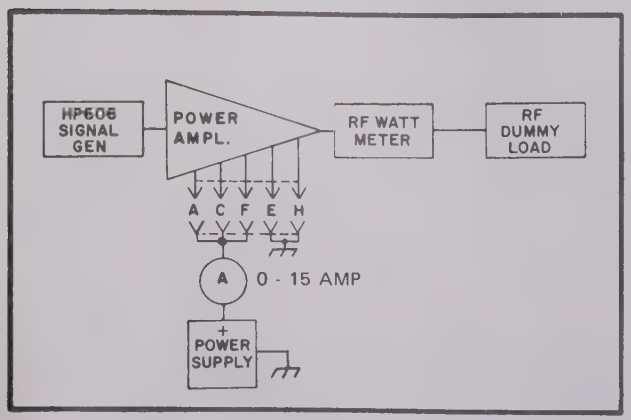


Figure 5.4 Power Amplifier Test Setup

5.8.4.3 Before applying D.C. power, make sure the signal generator output is at zero. Then slowly increase the power supply voltage, observing the ammeter, until +28V is reached. At this point the ammeter should be reading approximately 1 ampere. If, during the increasing of the source voltage, the current rises well beyond the 1 ampere level, a short circuit exists on the line, or one or both output transistors have failed. To determine which output transistor is defective, allow the current to remain at approximately 3 amperes for 30 seconds. Then feel both transistors. The defective one will be much hotter than the good one.

5.8.4.4 If power output is low, the defective stage can be readily determined by observing with an oscilloscope the wave form at the input center tap of T2 (the 10 turnside) for the predriver, T3 for the driver, or T5 for the output stage. Under normal operating conditions, these points will show primarily second harmonic energy, so if a large amount of fundamental frequency energy is present, it means only half of the push pull stage is operational. Now that the defective stage has been located, an observation of the respective collector wave forms will determine the failed transistor. The collector wave form on the good transistor will be much greater in amplitude than that of the defective one.

5.8.4.5 While it is necessary to remove the printed circuit board from the heat sink to replace 1A7Q1 or Q2, it is NOT necessary to remove the board to replace 1A7Q3, Q4, Q5, or Q6. Transistors Q3 and Q4 may be removed by unscrewing the two nuts from the studs on these components and unsoldering four connections on the top of the board for each transistor. The transistors may be removed from the top of the board. Transistors Q5 and Q6 may be removed by unscrewing the four hold down screws (two per transistor), and unsoldering four connections for each transistor. These transistors also remove from the top of the board.

NOTE

If the radio is used for voice only operation, it is permissible to replace only the defective output transistor (Q5 or Q6), leaving the other in place. However, if the radio is used for RTTY or data transmission, both Q5 and Q6 should be replaced as a matched pair, if one is found to be distroyed. Failure to do so will likely cause increased intermodulation products and reduces reliability.

5.8.4.6 Before replacing any or all of the four high power transistors, Q3, Q4, Q5 and Q6, clean the heat sink area thoroughly around each transistor making sure no foreign particles can come between the transistor and the heat sink. Apply a fresh coat of heat sink compound to the transistor and mount the transistor solidly to the heat sink before soldering. Make sure all collector leads point toward the output connector, 1A7J2. Trim the leads to convenient lengths and solder to the printed circuit board. If Q5 and Q6 have been replaced it is recommended that the bias current be checked. This can be done by unsoldering the top wire of inductor L5 from the top of T5/T6. Connect a d-c ammeter from L5 to T5/T6. Apply 28VDC to the PA and adjust R23 until the meter reads 80 ma. Remove the ammeter and carefully resolder the inductor lead.

5.8.4.7 When transistor replacement is complete, test the power amplifier per test setup shown in figure 5.4. Apply D.C. power and slowly increase signal generator drive until 100 watts is shown on the wattmeter. The ammeter should indicate approximately 8.5 amperes. Allow the amplifier output to remain at 100 watts for one or two minutes. Remove the signal drive. The ammeter should drop to 1 ampere or slightly greater. If the current drops to 2 amperes or higher and slowly decays toward the 1 ampere level, this means that one or both output transistors has not been properly seated to the heat sink. They should be removed, examined for foreign particles and replaced carefully. Repeat the above test to insure proper installation.

5.8.4.8 After installing power amplifier in transceiver, check current ALC to be sure it is operational. This may be done by placing an oscilloscope probe on the collector of 1A3A1Q4 on the VHF mixer board. Set the vertical range to 2VDC per division, sweep speed at 50 milliseconds per division and set trace at lowest marker division. Set transceiver mode switch to USB and XMIT GAIN fully CCW. Key transceiver and observe voltage rise. Trace should appear as in Figure 5.5A. Now place MODE switch in AM position and key transceiver. Oscilloscope trace should appear as in Figure 5.5B. The additional step in the wave form is evidence that the current ALC is operational and is preventing overdrive to the power amplifier. If this additional step is not observed, trouble shoot the current ALC loop and correct the problem before rekeying the transmitter. Without the current ALC protection, the power amplifier can be destroyed. It is designed to limit the amplifier current to10 amperes.

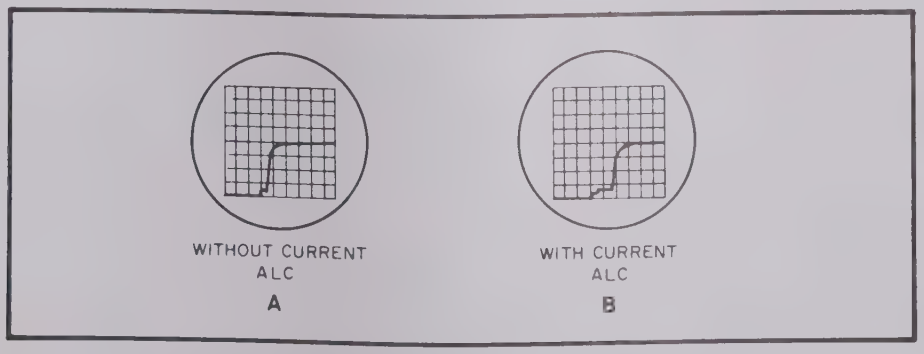


Figure 5.5 Current ALC Wave Form

This current can then be monitored across 1A7R24 in the power amplifier or 1A6R2 on the power supply regulator board. Since these resistors are 0.1 ohm resistance, a voltage of 1 volt across them represents 10 amperes current.

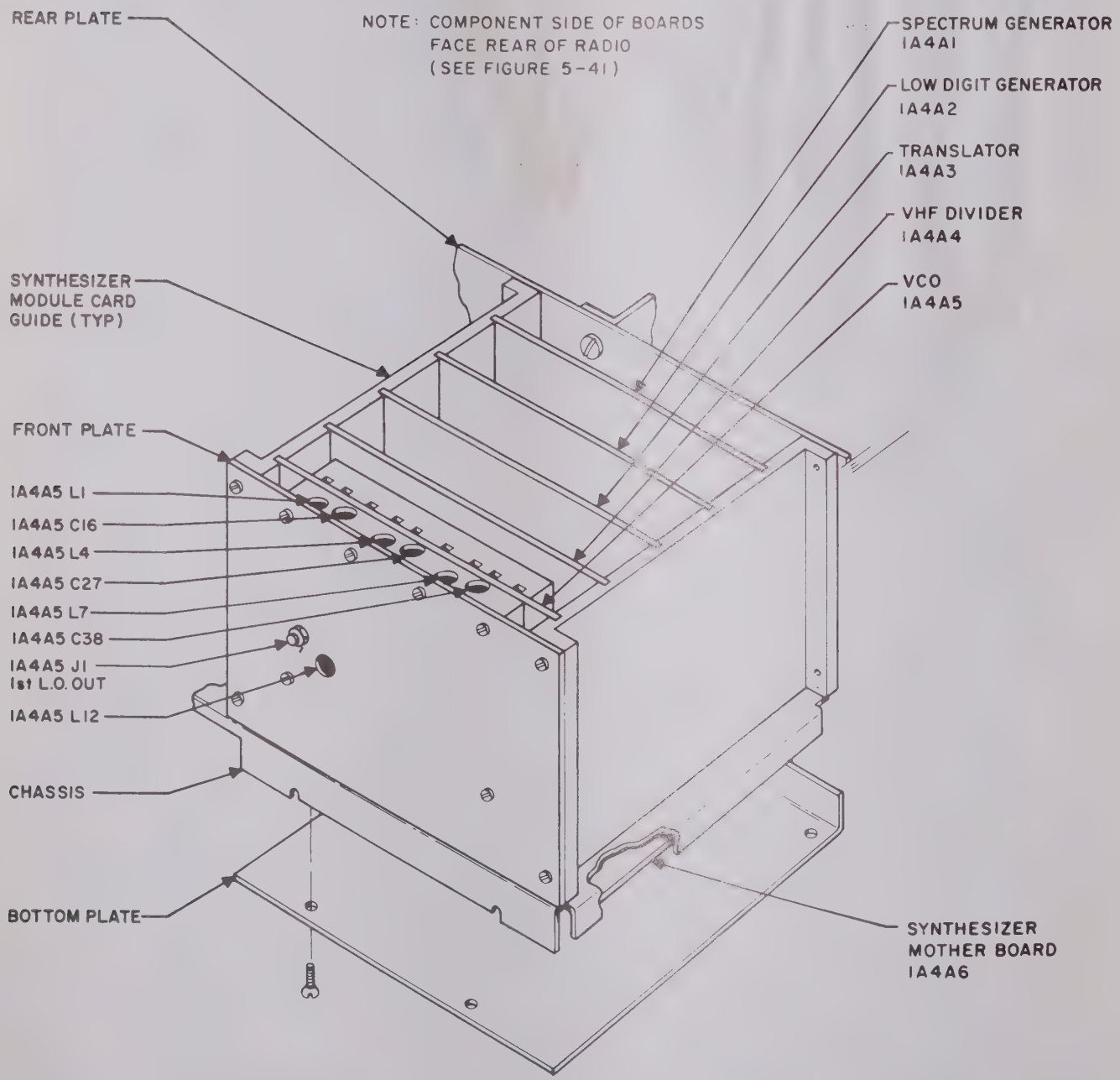


Figure 5.6 Synthesizer Mechanical Assembly

5.9 PRINTED CIRCUIT BOARDS

5.9.1 PRINTED CIRCUIT BOARD REPAIR AND MAINTENANCE

To avoid damage to the printed circuit boards during the replacement of components or integrated circuits, extreme care should be used in soldering and desoldering operations. A low wattage (30 to 50 watts) soldering iron with a narrow tip (1/8" or smaller) should be used. Due to the circuit density on the boards, solder "bridges" or short circuits between adjacent copper foil runs are possible if care is not used during soldering operations. After soldering is completed, the area around the connection should be closely inspected for excess solder or "bridges" between connections and runs with any removed before reinstalling the board. A low wattage iron is necessary to prevent the application of excesive heat to the copper foil. Excessive heat will cause the foil to separate from the board rendering the board unrepairable. Only a good electronic-grade rosin core solder should be used in making repairs. DO NOT USE ACID CORE SOLDER!

NOTE

Caution should be used when removing the printed circuit boards from their enclosures. A card extractor can be easily made from a length of heavy gauge wire (#10-#12). Form a hook at each end and insert each hook into the holes provided at the top outer edge of each board. Apply gentle upward pressure near each hook to free the board(s) from their edge connectors.

When replacing boards in their edge connectors, insure that the proper board is in its correct position in the card guides provided at each board edge and gently apply downward pressure to the top edge of the board until it is fully seated in its edge connector.

DO NOT USE SCREWDRIVERS OR PLIERS TO REMOVE BOARDS!

LOGIC NOTES

Various types of digital and linear logic devices are used in the GSB-900SC. A brief description of these devices is presented to explain their basic operation and symbolic notation.

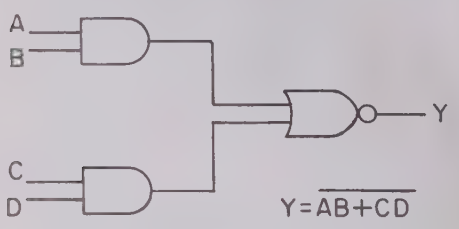
HIGH - a high also known as a logic high or a logic one is a signal in two state 5 volt logic that generally measures between 2.5 volts and 5.0 volts.

LOW - a low also known as a logic low or a logic zero is a signal in two state 5 volt logic that generally measures between 0 and 0.5 volts.

5.10.1 AND GATE

An And gate can have two or more inputs. The level of the output is dependent on the state of all the input levels. For a high level to appear at the output, all of the input levels must be high. If any or all inputs are low, the output will be low. The logic equation is read: Y equals A and B.

5.10.2 AND-OR-INVERT GATE



The And-Or-Invert gate may have two or more input pairs. For the output, Y, to be low, both inputs of any pair of inputs must be high. To produce a high output, Y, at least one input of each pair of inputs must be low. The logic equation is read: Y equals A and B or C and D NOT (low).

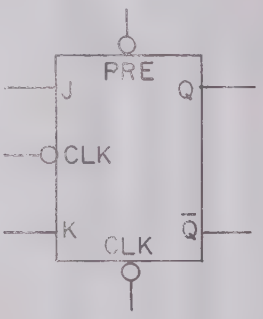
5.10.3 NAND GATE

A Nand gate may have two or more inputs. If both inputs are high, the output is low. If either or both inputs are low, the output will be high. The logic equation reads: Y equals A and B NOT.

5.10.4 OR GATE

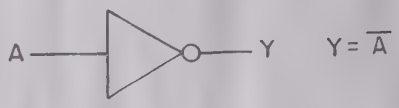
The Or gate has two inputs. The output is high if either or both of the inputs is high. If both inputs are low, the output will be low. The logic equation reads: Y equals A or B.

5.10.5 J-K FLIP FLOP



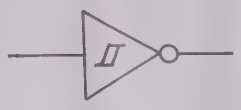
The J-K Flip Flop is a memory device that records both the status of a single bit of information on an output called Q and the inverse of that bit of information on an output called $\overline{Q}$. The status of the outputs of the device are determined by the levels produced on inputs called J, K, Clock, Clear and Preset. If the Clear input is forced low while the Preset input is high, the output Q will always be low and the output $\overline{Q}$ will be high. The condition of the outputs Q and $\overline{Q}$ will not change after the Clear input becomes high. If the Preset input is forced low while the Clear input is high, the Q output will always be high and the output $\overline{Q}$ will be low. This condition, too, will persist after the Preset input is driven high. If a Clock pulse occurs which first goes high and then back low while the J, Clear and Preset inputs are high and the K input is low, the Q output will become high if it wasn't already and the $\overline{Q}$ input will switch low if it wasn't already. If the same Clock pulse occurs while the J input is low and the K, Clear and Preset inputs are high the Q output will switch low if it wasn't already low and the $\overline{Q}$ output will switch high if it wasn't already high. If the Clock pulse occurs while inputs J and K are low and Clear and Preset are high no output change on Q or $\overline{Q}$ will occur. If J, K, Clear and Preset are high each successive Clock pulse will cause the outputs Q and $\overline{Q}$ to change state or toggle from their former logic state to the inverse of that former logic state.

5.10.6 INVERTER



The Inverter has a single input. The output level is the opposite of the input level or inverted. The logic equation reads: Y equals A NOT.

5.10.7 SCHMITT TRIGGER



The Schmitt Trigger is basically an inverter that exhibits different output switching characteristics for positive and negative going input pulses. The trigger uses hysteresis, or backlash in the switching mode. Hysteresis is the voltage difference between the positive and negative thresholds. A positive going threshold of approximately 1.7 volts will cause the output to switch low, and a negative going threshold of approximately 0.9 volts will cause the output to switch high. The output can be triggered from slow input ramps. This device can handle DC input levels from 0.5 volts to 2.5 volts and still produce a logic output voltage. Standard 5 volt logic devices produce indeterminate output voltages if they see input voltages between 0.8 and 2.0 volts.

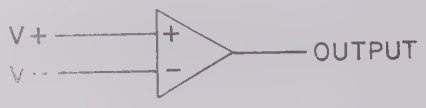
5.10.8 PROM

Programmable Read Only Memories (PROMS) are logic elements that are manufactured in many different input and output configurations. Proms are programmed by blowing selected fuse links, and once programmed cannot be altered. Selection of addresses produces an output or number of outputs previously programmed in that memory location. Depending on the device type, outputs may be factory manufactured with logical 1 or logical 0 outputs. In the case where a device is supplied with logical 1 outputs all desired logical 0 outputs must be programmed. If outputs are supplied as logical 0's, all desired logical 1 outputs must be programmed.

5.10.9 RAM

Random Access Memories (RAMS) are logic elements that are manufactured in many different input and output configurations. Unlike the Prom, a Ram can be re-programmed over again many times and the information stored can be retrieved by utilizing Read/Write, Chip enable and address inputs. The GSB-900SC utilizes six CMOS Rams in the memory system for reliability and low power consumption.

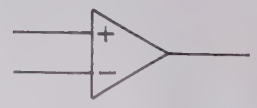
5.10.10 VOLTAGE COMPARATOR



A Voltage Comparator has two inputs, V+ and V-. The V+ input is normally set to a fixed voltage level or reference voltage. The V- input is usually variable. The output is high as long as the V+ input is more positive than the V- input. As the V- input rises, or becomes more positive, and exceeds the V+ input level, the output switches low. If the variable V- input voltage becomes less positive than the V+ reference input, the output switches to a high level once again.

5.10.11 OPERATIONAL AMPLIFIER

The Operational Amplifier generally provides a method of converting a small input signal into a signal of greater magnitude. The output voltage follows the changes that occur at the input terminals. In the case where the



V- input is tied to the operational amplifier output, the output voltage follows the input voltage supplied at the V+ input. This circuit is in fact called a voltage follower circuit. It is a circuit used to convert a high impedance variable voltage output to an equivalent Low impedance variable voltage output which will not be as readily affected by variations in loading as a high impedance output would be.

5.10.12 CORRECT LOGIC LEVEL EXAMPLES

Table 5.10 indicates examples of the correct logic levels that should appear at the pins of the Memory printed circuit board edge connector 1A1A7P1, and at the Address pins of the RAMS with the Channel Selector switches in the positions indicated, and the Frequency Control Mode Keyswitch in the Load Freq position. The individual address inputs to the memories are paralleled (bused) together, so logic levels that appear at an address input pin will appear at the corresponding pins of all six RAMS.

In the Read Freq mode, address A0, pin 4, will indicate a "0", or low logic state to indicate a receive frequency location, and a "1", or high logic state to indicate a transmit frequency location when the Load XMT pushbutton is depressed.

By examining the logic levels and Channel Selector switch positions in the table, the proper address vs. switch position logic can be determined for any of the one-hundred switch position combinations. Note that the 4 bits of information comprising the Channel 10's digit and the 4 bits of information comprising the Channel Units digit are each BCD representations of the Channel switch settings. Note too that the RAM addresses A1 through A7 are the binary equivalent of the Channel 10's and Channel Units two digit decimal representation of channel.

5.10.13 INVERTED SIGNALS

An inverted signal with respect to logic is denoted by the signal title with a bar over the top of the signal title. An inverted signal or one with a bar over its title is a signal that is low when the signal is present and high when it is not present. As an example, if a signal is called Read Freq, then the inverted equivalent of Read Freq would be written as $\overline{\text{Read Freq}}$ and described either as Read Freq Inverted or Read Freq Not.

Channel Dial Setting	XMT/RCV	1A1A7P1 Channel 10's 80 Pin 4	40 Pin 13	20 Pin 76	10 Pin 74	1A1A7U3 through U8 Channel Units 8 Pin 66	4 Pin 62	2 Pin 64	1 Pin 60	Address A7 Pin 7	A6 Pin 6	A5 Pin 5	A4 Pin 21	A3 Pin 1	A2 Pin 2	A1 Pin 3	AØ Pin 4
00	RCV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
00	XMT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
09	XMT	0	0	0	0	1	0	0	1	0	0	0	1	0	0	1	1
09	RCV	0	0	0	0	1	0	0	1	0	0	0	1	0	0	1	0
10	XMT	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	1
19	RCV	0	0	0	1	1	0	0	1	0	0	1	0	0	1	1	0
23	XMT	0	0	1	0	0	0	1	1	0	0	1	0	1	1	1	1
32	RCV	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0	0
47	XMT	0	1	0	0	0	1	1	1	0	1	0	1	1	1	1	1
50	RCV	0	1	0	1	0	0	0	0	0	1	1	0	0	1	0	0
56	RCV	0	1	0	1	0	1	1	0	0	1	1	1	0	0	0	0
69	RCV	0	1	1	0	1	0	0	1	1	0	0	0	1	0	1	0
74	XMT	0	1	1	1	0	1	0	0	1	0	0	1	0	1	0	1
88	RCV	1	0	0	0	1	0	0	0	1	0	1	1	0	0	0	0
99	XMT	1	0	0	1	1	0	0	1	1	1	0	0	0	1	1	1

Table 5.10 Correct Logic Level Examples

U28, U29 Binary Coded Decimal to Decimal Decoder Truth Table

OUTPUT Logic Low Pin #	INPUT PIN# BCD 12	13	14	15	DEC#	OUTPUT STATE 0	1	2	3	4	5	6	7	8	9
1	L	L	L	L	0	L	H	H	H	H	H	H	H	H	H
2	L	L	L	H	1	H	L	H	H	H	H	H	H	H	H
3	L	L	H	L	2	H	H	L	H	H	H	H	H	H	H
4	L	L	H	H	3	H	H	H	L	H	H	H	H	H	H
5	L	H	L	L	4	H	H	H	H	L	H	H	H	H	H
6	L	H	L	H	5	H	H	H	H	H	L	H	H	H	H
7	L	H	H	L	6	H	H	H	H	H	H	L	H	H	H
9	L	H	H	H	7	H	H	H	H	H	H	H	L	H	H
10	H	L	L	L	8	H	H	H	H	H	H	H	H	L	H
11	H	L	L	H	9	H	H	H	H	H	H	H	H	H	L

Table 5.11 Binary Coded Decimal to Decimal Decoder Truth Table

H = High Level (Off), L = Low Level (On)

1A1A6 U21 U21 Input Pin #					CORRESPONDING SELECTED FREQUENCY	1A1A6 U21 U21 Output Pin #							
14	13	12	11	10		9	7	6	5	4	3	2	1
L	L	L	L	L	0 MHz	H	L	L	L	L	L	L	L
L	L	L	L	H	1 MHz	L	L	L	L	L	L	L	H
L	L	L	H	L	2 MHz	L	L	L	L	L	L	H	L
L	L	L	H	H	3 MHz	L	L	L	L	L	H	L	L
L	L	H	L	L	4 MHz	L	L	L	L	H	L	L	L
L	L	H	L	H	5 MHz	L	L	L	L	H	L	L	L
L	L	H	H	L	6 MHz	L	L	L	H	L	L	L	L
L	L	H	H	H	7 MHz	L	L	L	H	L	L	L	L
L	H	L	L	L	8 MHz	L	L	L	H	L	L	L	L
L	H	L	L	H	9 MHz	L	L	H	L	L	L	L	L
H	L	L	L	L	10 MHz	L	L	H	L	L	L	L	L
H	L	L	L	H	11 MHz	L	L	H	L	L	L	L	L
H	L	L	H	L	12 MHz	L	L	H	L	L	L	L	L
H	L	L	H	H	13 MHz	L	H	L	L	L	L	L	L
H	L	H	L	L	14 MHz	L	H	L	L	L	L	L	L
H	L	H	L	H	15 MHz	L	H	L	L	L	L	L	L
H	L	H	H	L	16 MHz	L	H	L	L	L	L	L	L
H	L	H	H	H	17 MHz	L	H	L	L	L	L	L	L
H	H	L	L	L	18 MHz	L	H	L	L	L	L	L	L
H	H	L	L	H	19 MHz	L	H	L	L	L	L	L	L

Table 5.12 Band Prom Truth Table. L = Logic Low, H = Logic High.

DESIGN ASSEMBLY	DESIGN SUBASSEMBLY	DESCRIPTION	SUNAIR PART NUMBER	
1A1		FRONT PANEL ASSEMBLY	1003640010	
	1A1A1	SPEAKER DRIVER BOARD	5024041798	
	1A1A2	DISPLAY DRIVER BOARD	1003670008	
	1A1A3	DISPLAY BOARD	5024645596	
	1A1A4	POWER SUPPLY - BATTERY	1003840001	
	1A1A5	MOTHER BOARD	1003650007	
	1A1A6	BAND STEERING BOARD	1003600000	
	1A1A7	MEMORY BOARD	1003620001	
1A2		METER PANEL ASSEMBLY	5024041992	GRN
		OR	5024041950	GRY
		ANTENNA TUNING CONTROL ASSY (OPTION)	or 5024042395 5024042352	 GRN GRY
1A3		RECEIVER/EXCITER ASSEMBLY	----------	
	1A3A1	V.H.F. MIXER	5024100093	
	1A3A2	I.F./FILTER	5024120094	
	1A3A3	SIDEBAND GENERATOR	5024130090	
	1A3A4	AUDIO BOARD	5024140095	
	1A3A5	RECEIVER/EXCITER MOTHER BOARD	5024011899	
1A4		SYNTHESIZER ASSEMBLY	----------	
	1A4A1	SPECTRUM GENERATOR	5024060091	
	1A4A2	LOW DIGIT GENERATOR	5024070097	
	1A4A3	TRANSLATOR	5024080092	
	1A4A4	V.H.F. DIVIDER	5024090098	
	1A4A5	V.C.O.	5024100093	
	1A4A6	SYNTHESIZER MOTHER BOARD	5024011597	
1A5		FILTER MODULE	5024050096	
	1A5A1	ODD CHANNEL FILTER BOARD	5024050592	
	1A5A2	EVEN CHANNEL FILTER BOARD	5024051696	
	1A5A3	RECEIVE FILTER BOARD	5024052692	
	1A5A4	MOTOR CONTROL BOARD	5024052994	
1A6		POWER SUPPLY	5024020090	
	1A6A1	REGULATOR BOARD ASSEMBLY	5024020596	
	1A6A2	D.C. INVERTER (OPTION)	5024021398	
1A7		R.F. POWER AMPLIFIER ASSY.	5024030095	
	1A7A1	R.F. POWER AMPLIFIER CIRCUIT BOARD	5024030290	
1A8		CHASSIS ASSEMBLY	5024010094	GRN
			5024010051	GRY

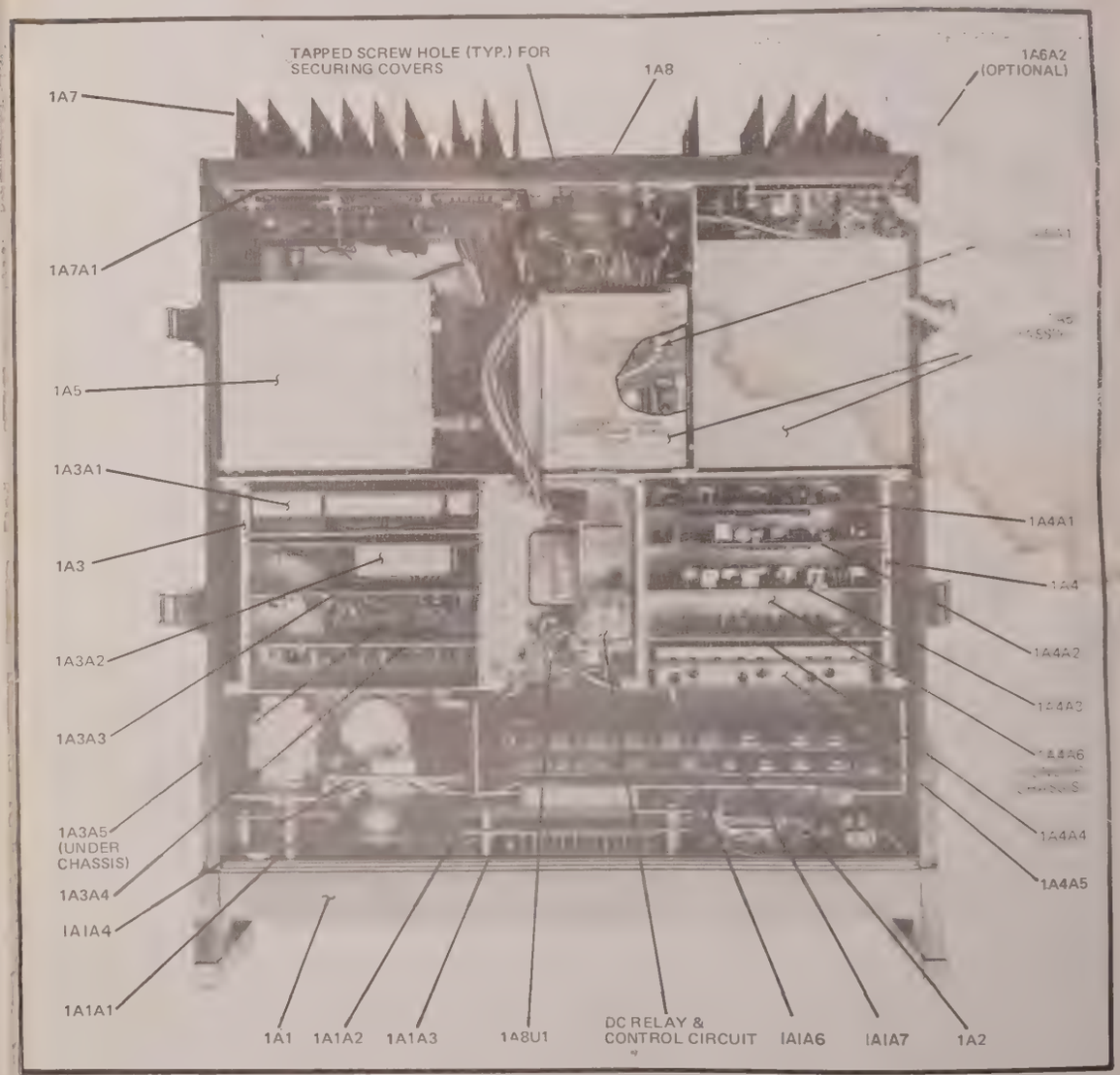
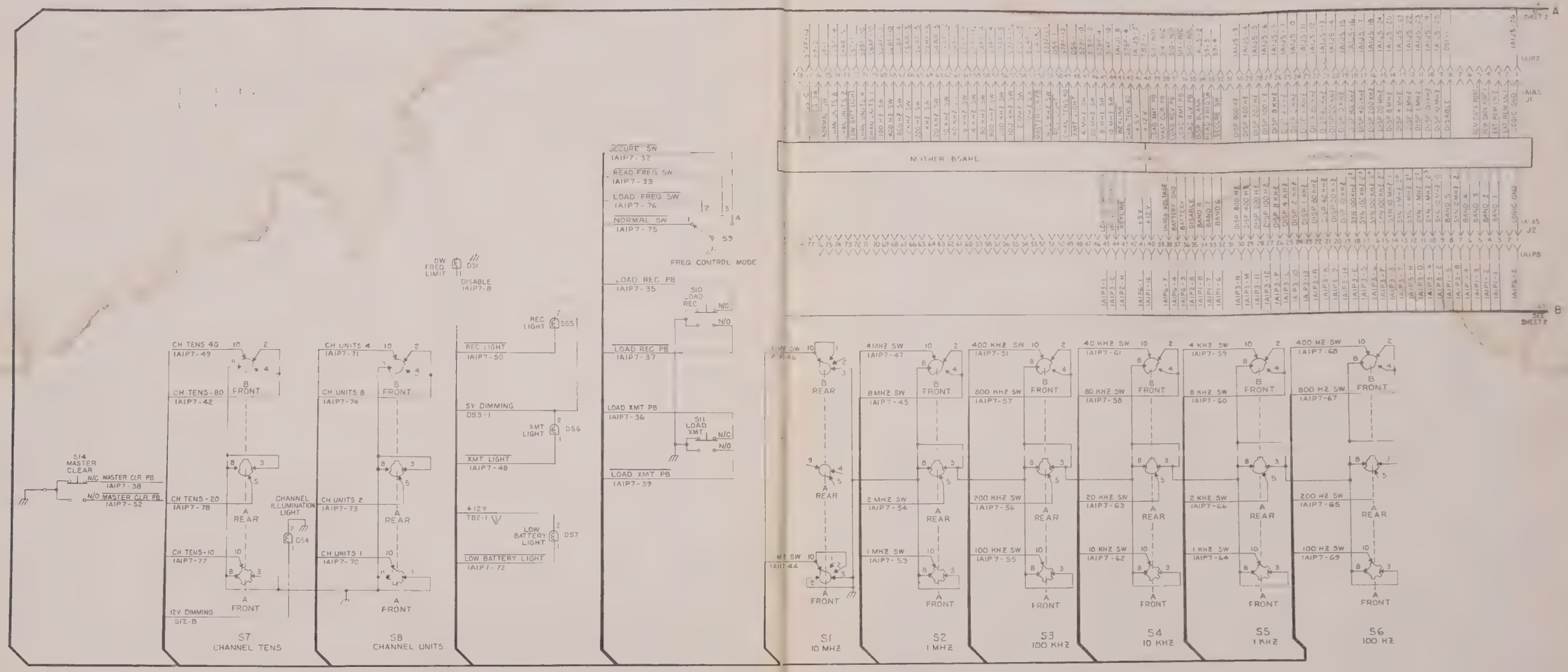


Figure 5.7 GSB-900SC Top View and Table of Assemblies

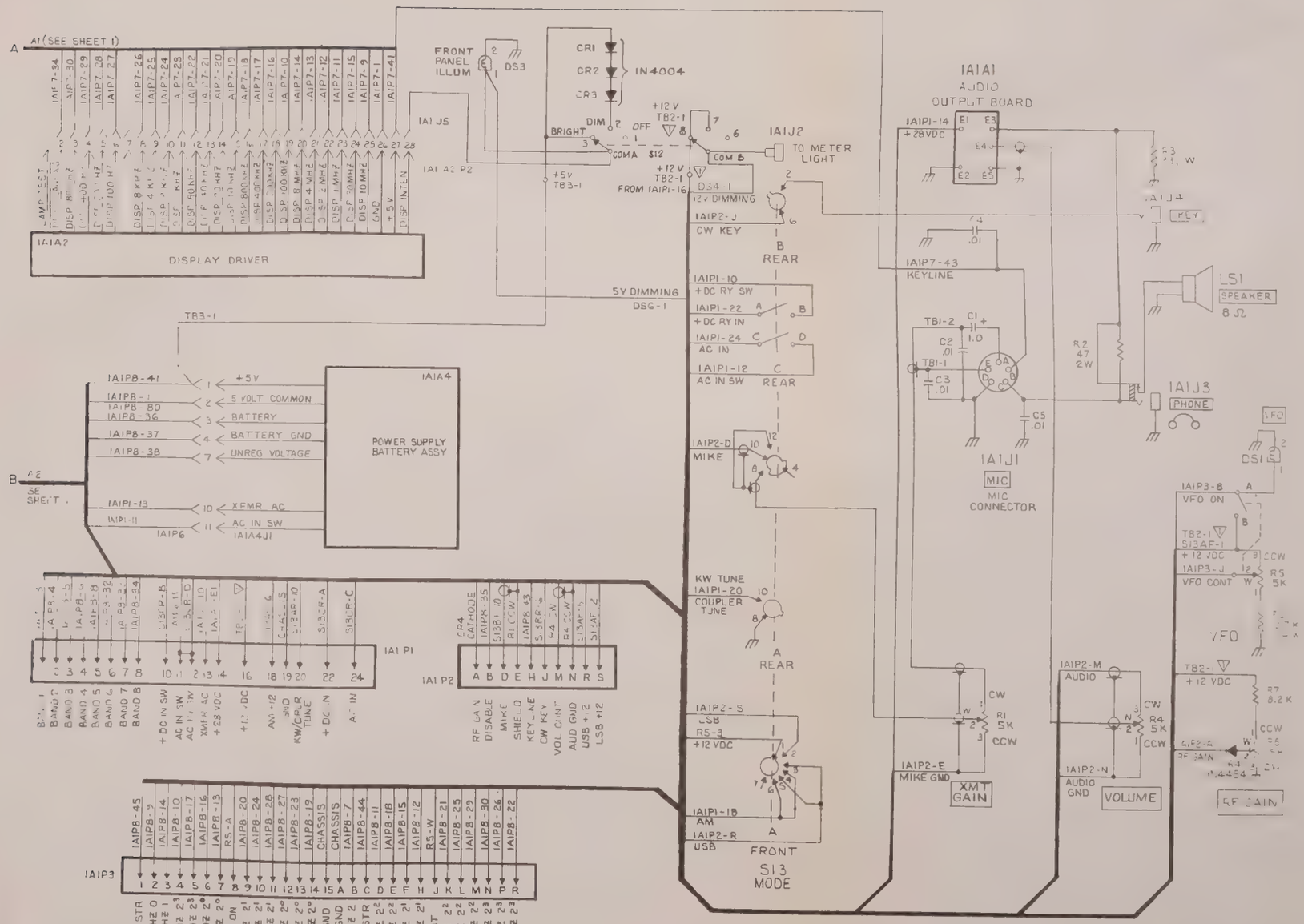
5.11 SCHEMATIC DIAGRAMS

The following pages contain schematic diagrams, voltage charts, parts lists and depot spare parts requirements for all assemblies of the GSB-900SC.



NOTES: UNLESS OTHERWISE SPECIFIED
1. COMMON CONNECTION FOR +12 VDC
2. ALL RESISTORS ARE IN OHMS, 1/2 W.
3. ALL CAPACITORS ARE IN MICROFARADS

1003640079E



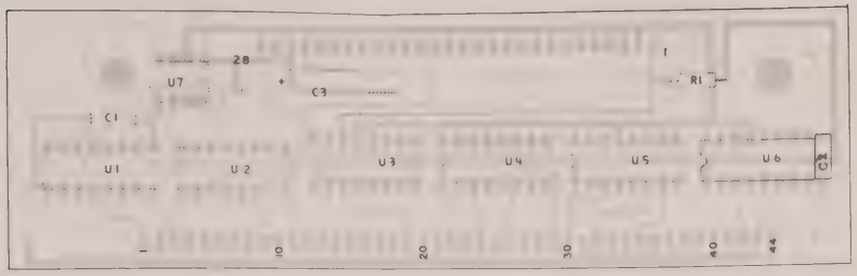
1003640001M FRONT PANEL ASSY, GREEN

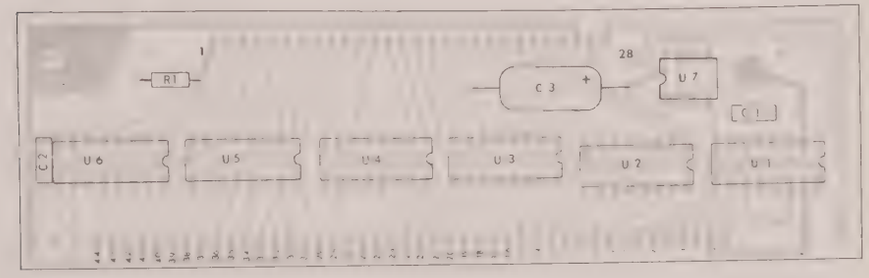
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	FRONT PANEL ASSY, GREEN SC	1003640001
1A1A4	Power Supply Battery Assy. SC	1003840001
1A1A6	PC Assy. Bnd Steering GSB-900SC	1003600000
1A1A7	PC Assy. Memory GSB-900SC	1003620001
1A1J1	Connector, Power, 5 Pin Round	0753560003
1A1J3	Connector, Phone Jack, 2 Cond.	0754430006
1A1J4	Connector, Headphone	0840850000
C1	Capacitor, 1 UF, 35 V, T368	0283630001
C2	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C3	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C4	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C5	Capacitor, 0.01 UF, 25 V, X5S	0281620008
CR1	Diode, Rectifier 1N4004	0405180004
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Rectifier 1N4004	0405180004
CR4	Diode, Signal, Sil. 1N4454	0405270003
DS1	Lamp Assy. Red	0840740000
DS2	Lamp Assy. Amber	0840870001
DS3	Lamp Assy. Painted	5024641523
DS4	Lamp Assy. Clear	0840720009
DS5	Lamp Assy. Amber	5024641507
DS5	Lamp Assy. Amber	5024641507
DS7	Lamp Assy. Red	0840740000
LS1	Speaker, 3x5 Oval, 8 ohm, 5W	0877970009
R1	Pot., 5K, 20%, 2W, 1/4 Shaft	0346020000
R2	Resistor, 47, 10%, 2W	0163720002
R3	Resistor, 33, 10%, 1W	0165660007
R4	Pot., Tandem 5K/5K, 20%, 1/2W	5024641400
R5	Pot., 5K, Linear	5024641701
R6	Resistor, 2.7K, 10%, 1/4W	0186670001
R7	Resistor, 8.2K, 5%, 1/2W	0189540001
R8	Pot., Tandem, 5K/5K 20%, 1/2W	5024641400
S1	Switch, Rotary, 10 MHz	5024041101
S2	Switch, Rotary, 1 KHz, 100 Hz	5024041500
S3	Switch, Rotary, 1 KHz, 100 Hz	5024041500
S4	Switch, Rotary, 1 KHz, 100 Hz	5024041500
S5	Switch, Rotary, 1 KHz, 100 Hz	5024041500
S6	Switch, Rotary, 100 Hz	5024041500
S7	Switch, Rotary, 1 KHz, 100 Hz	5024041500
S8	Switch, Rotary, 1 KHz, 100 Hz	5024041500
S9	Switch, Rotary, 4 Pos. Keylock	1003990011
S10	Switch, Pushbutton, SPDT	1000870014
S11	Switch, Pushbutton, SPDT	1000870014
S12	Switch, Rotary, 2 P5T 3/8 Shaft	0346600006
S13	Switch, Rotary, Mode	5024041607
S14	Switch, Pushbutton, SPDT	1000870014

NOTES: UNLESS OTHERWISE SPECIFIED:
1. ▽ COMMON CONNECTION FOR +12 VDC.
2. ALL RESISTORS ARE IN OHMS, 1/2 W.
3. ALL CAPACITORS ARE IN MICROFARADS.

Figure 5.8 Secure Channel Front Panel Wiring Diagram

1A1A2 DISPLAY DRIVER BOARD ASSEMBLY

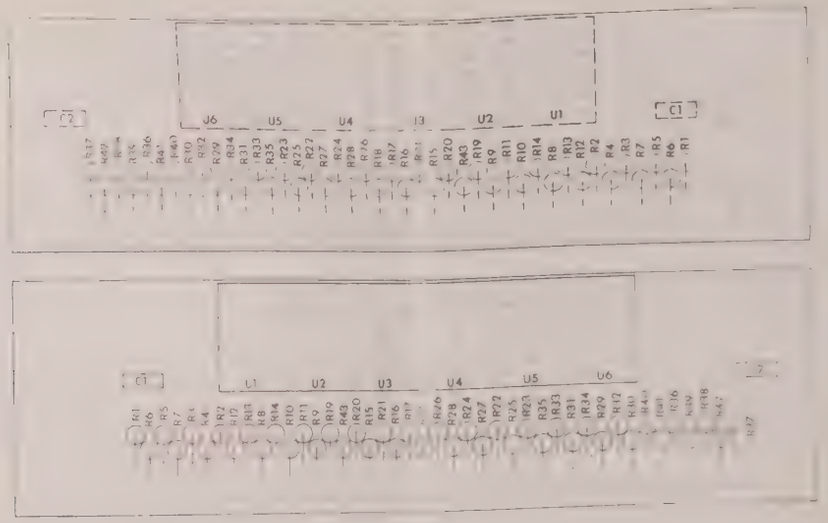




1003670008A PC ASSY DISPLAY DRVR (ECN

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY DISPLAY DRVR.	1003670008
1A1A2J1	Connector, Power, 11 Pin Rect.	0754360008
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C3	Capacitor, 25 UF, 15 V, TT	0284160008
R1	Resistor, 4.7 K, 5%, 1/4 W	0170770001
U1	IC Digital SN7446A	0448560003
U2	IC Digital SN7446A	0448560003
U3	IC Digital SN7446A	0448560003
U4	IC Digital SN7446A	0448560003
U5	IC Digital SN7446A	0448560003
U7	IC Digital SN75451BP	1003950035
	Connector, PC, 36 Pin Female (Cut to 28 Pin)	8033235004

1A1A3 DISPLAY BOARD



5024645596G PC ASSY DISPLAY

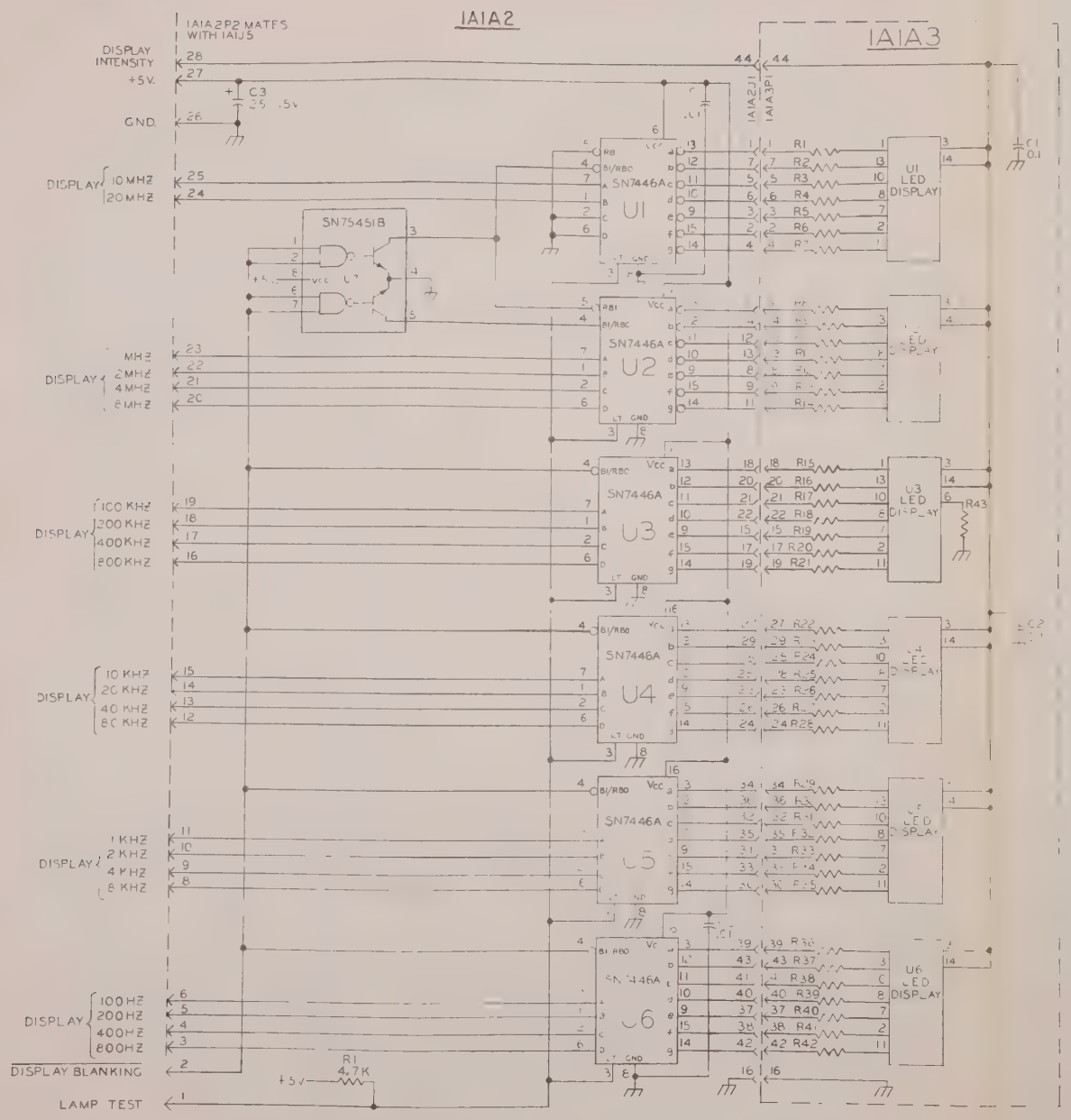
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, 0.1 UF, 50 V	0281610002
C2	Capacitor, 0.1 UF, 50 V	0281610002
R1	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R2	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R3	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R4	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R5	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R6	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R7	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R8	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R9	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R10	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R11	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R12	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R13	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R14	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R15	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R16	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R17	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R18	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R19	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R20	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R21	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R22	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R23	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R24	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R25	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R26	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R27	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R28	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R29	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R30	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R31	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R32	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R33	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R34	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R35	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R36	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R37	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R38	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R39	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R40	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R41	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R42	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
R43	Resistor, Carbon, 220 ohms, 10%, 1/4 W	0171320000
U1	Connector, PC, 22 Pin Male	0754370003

1003740006C FREQ. DISPLAY ASSY

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	FREQ. DISPLAY ASSY	1003740006
1A1A2	PC Assy. Display Drvr.	1003670008
1A1A3	PC Assy. Display	5024645596
U1	Diode, Led, 7 Segment, Hi Int.	1001260015
U2	Diode, Led, 7 Segment, Hi. Int.	1001260015
U3	Diode, Led, 7 Segment, Hi. Int.	1001260015
U4	Diode, Led, 7 Segment, Hi. Int.	1001260015
U5	Diode, Led, 7 Segment, Hi. Int.	1001260015
U6	Diode, Led, 7 Segment, Hi. Int.	1001260015
	Standoff, F-F, 6-32 1.000 L	0503920002
	Spacer, .171 ID, .250 OD, .375 L	0509030009
	Socket Assy. Display	0842120009

S10037400O6A



NOTES: UNLESS OTHERWISE SPECIFIED
1. CAP. VALUES ARE IN μF.
2. ALL RESISTANCE VALUES ARE IN OHMS ±10% 1/4 WATTS.
3. RESISTORS R1 THRU R43 ARE 220 OHMS.

Figure 5.9 Display Schematic

S10038400O1A

1003840001K POWER SUPPLY BATTERY ASSY GSB-900SC

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	POWER SUPPLY BATTERY ASSY SC	1003840001
1A1A4J1	Connector, Power, 11 Pin Rect.	0753320002
C1	Capacitor, 10000 UF, 25 V, CG	1003980031
C2	Not used	
C3	Capacitor, 0.1 UF, 12 V, Y5 F, 20%	0270100008
CR1	Diode, Bridge, SCBA-1	1002650020
T1	Transformer, 10 V RMS, 3 A OUT	1003800017
U1	IC Linear, Vol. Reg. LM323K	1003970036
	Capacitor, 1 UF, 35 V, T368	0283630001
	Lug, Solder, IT No. 8 3/4 L	0502060000
	Lug, Solder, IT No. 10 53/64 L	0502070005
	Tie, Cable, 11 1/2 Lg. 3 Dia.	0508400007
	Fuse, MDL, 1/2 Amp, 250 V	0841310009
	Fusemount, 1 Pole W/Terminals	0842490001
	Channel Rubber	0853610002
	Socket, Xsistor TO-3 Hi-Pwr	1000130029
	Plate, Battery Holder	1003510001
	Plate, Power Supply, SC	1003720005
	Heatsink, TO-3	1003720021
	Battery Holder, Steel	1003720030
	Wire Kit, Battery Assy	1003840027
	Tie, Cable, 4 Lg. 3/4 Dia.	0600240002

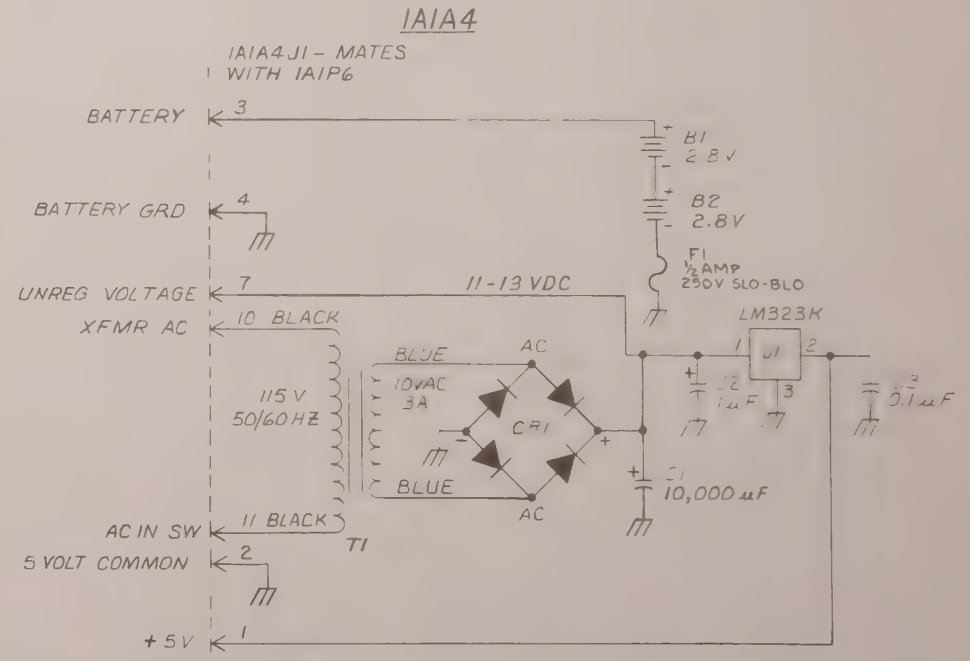
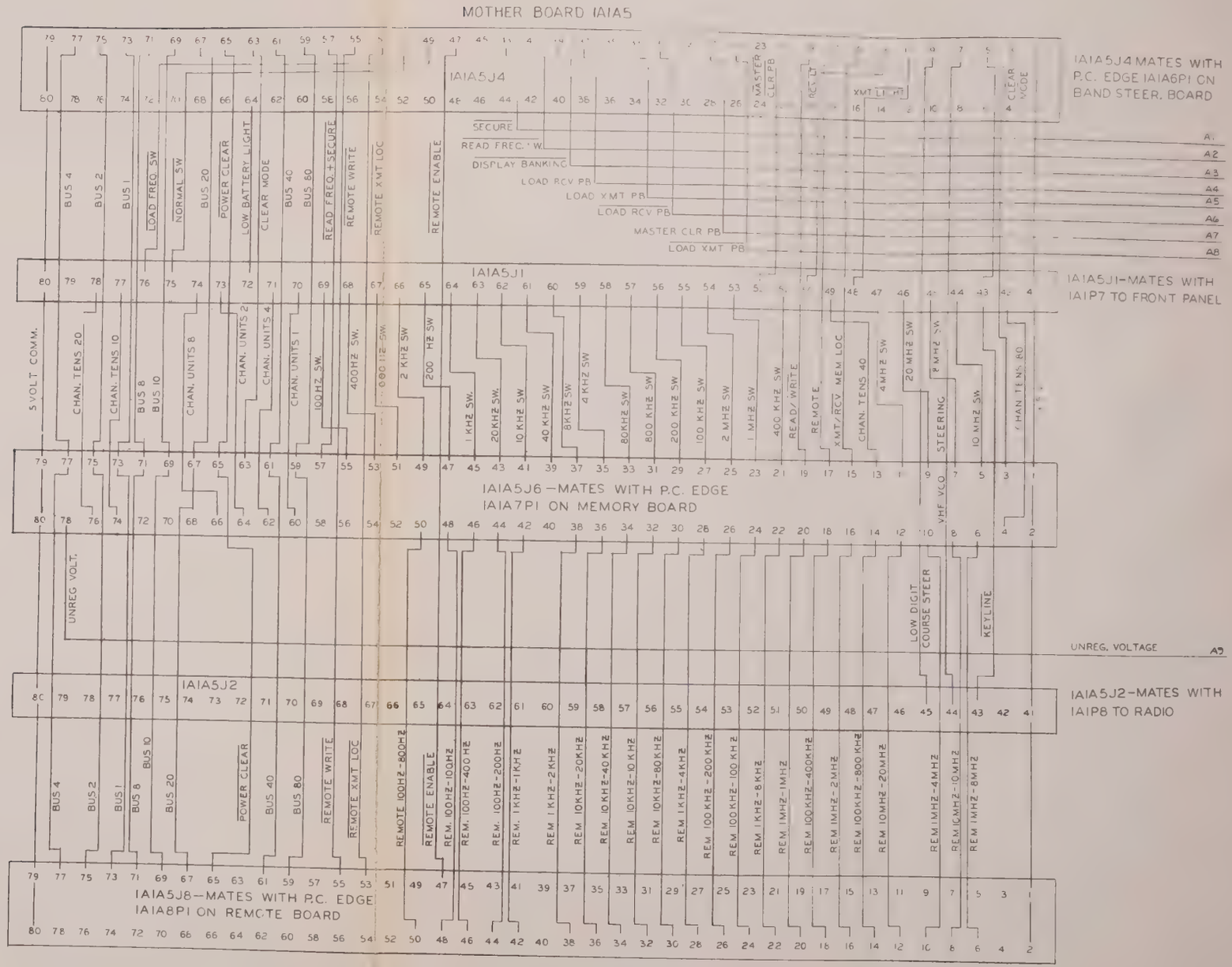


Figure 5.9A Power Supply Battery Schematic


MOTHER BOARD 1A1A5
1A1A5J4
1A1A5J1
1A1A5J6
1A1A5J2
1A1A5J8
SECURE
READ FREQ. W.
DISPLAY BANKING
LOAD RCV PB
LOAD XMT PB
LOAD RCV PB
MASTER CLR PB
LOAD XMT PB
REMOTE ENABLE
LOAD FREQ. SW
NORMAL SW
POWER CLEAR
LOW BATTERY LIGHT
CLEAR MODE
READ FREQ.+SECURE
REMOTE WRITE
REMOTE XMT LOC
BUS 1
BUS 2
BUS 4
BUS 8
BUS 10
BUS 20
BUS 40
BUS 80
5 VOLT COMM.
CHAN. TENS 20
CHAN. TENS 10
CHAN. UNITS 8
CHAN. UNITS 4
CHAN. UNITS 2
CHAN. UNITS 1
100 HZ SW.
200 HZ SW.
400 HZ SW.
800 HZ SW.
2 KHZ SW
200 HZ SW
1 KHZ SW.
20 KHZ SW.
10 KHZ SW
40 KHZ SW
8 KHZ SW
4 KHZ SW
80 KHZ SW.
800 KHZ SW
200 KHZ SW
100 KHZ SW
2 MHZ SW
1 MHZ SW
400 KHZ SW
READ/WRITE
REMOTE
XMT/RCV MEM LOC
CHAN. TENS 40
4 MHZ SW
20 MHZ SW
8 MHZ SW
STEERING
10 MHZ SW
CHAN TENS 80
UNREG VOLT.
LOW DIGIT
COURSE STEER
KEYLINE
REMOTE 100HZ-800HZ
REMOTE ENABLE
REM. 100HZ-100HZ
REM. 100HZ-400 HZ
REM. 100HZ-200HZ
REM. 1KHZ-1KHZ
REM 1 KHZ-2KHZ
REM 10KHZ-20KHZ
REM 10 KHZ-40 KHZ
REM 10KHZ-80 KHZ
REM 1KHZ-4KHZ
REM 100 KHZ-200 KHZ
REM 100KHZ-100 KHZ
REM 1KHZ-8KHZ
REM 1MHZ-1MHZ
REM 100KHZ-400KHZ
REM 1MHZ-2MHZ
REM 100KHZ-800 KHZ
REM 10MHZ-20MHZ
REM 1MHZ-4MHZ
REM 6MHZ-10MHZ
REM 1MHZ-8MHZ
1A1A5J4 MATES WITH P.C. EDGE 1A1A6P1 ON BAND STEER. BOARD
1A1A5J1-MATES WITH 1A1P7 TO FRONT PANEL
1A1A5J6—MATES WITH P.C. EDGE 1A1A7P1 ON MEMORY BOARD
UNREG. VOLTAGE A9
1A1A5J2-MATES WITH 1A1P8 TO RADIO
1A1A5J8—MATES WITH P.C. EDGE 1A1A8P1 ON REMOTE BOARD

1003650074B

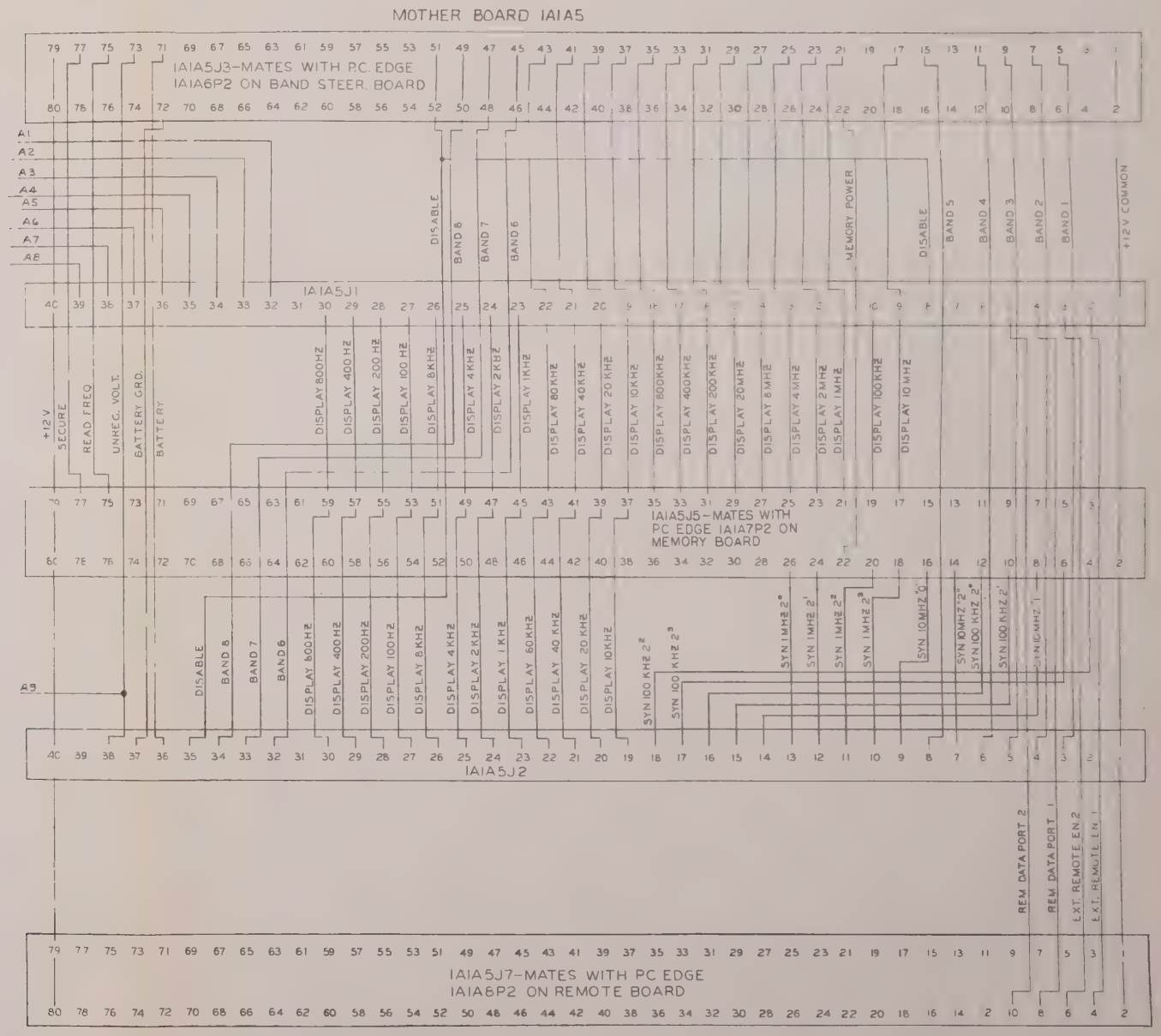
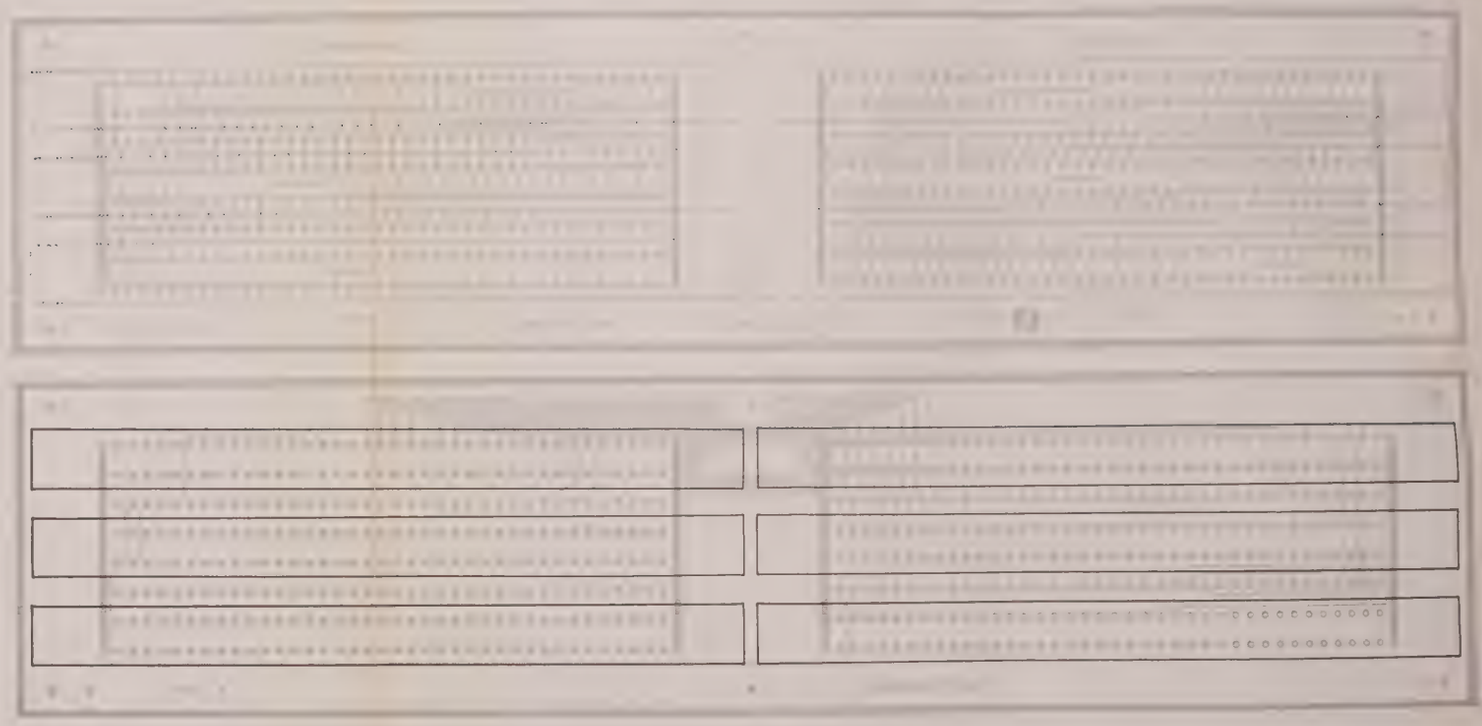


Figure 5.9B Mother Board Schematic

1003650007A MOTHER BOARD ASSY.

REF SYMBOL	DESCRIPTION	SUNAIR PART NO
	Mother Board Assy, GSB-900SC	1003650007
1A1A5J1	Pin Strap, Right Angle	0754390004
1A1A5J2	Pin Strap, Right Angle	0754390004
1A1A5J3	Connector, Printed Circuit, 80 Pin Female	1003810012
1A1A5J4	Connector, Printed Circuit, 80 Pin Female	1003810012
1A1A5J5	Connector, Printed Circuit, 80 Pin Female	1003810012
1A1A5J6	Connector, Printed Circuit, 80 Pin Female	1003810012
1A1A5J7	Connector, Printed Circuit, 80 Pin Female	1003810012
1A1A5J8	Connector, Printed Circuit, 80 Pin Female	1003810012
1A1A5J1	Pin Strap, Right Angle, 12 Pin	1003810021
1A1A5J2	Pin Strap, Right Angle, 12 Pin	1003810021



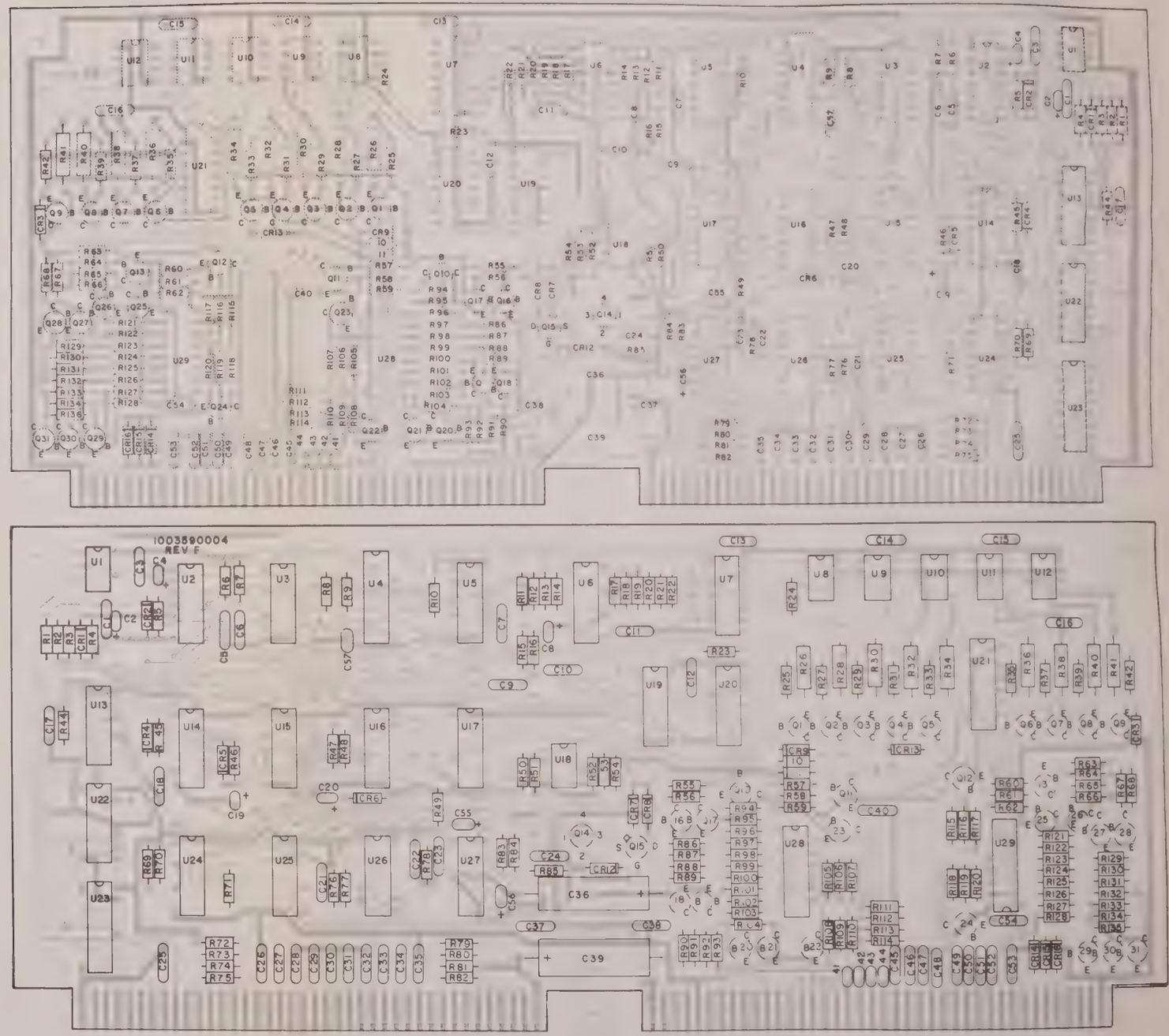
1003600000D PC ASSY BND STEERING GSB-900SC

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY BND STEERING GSB900SC	1003600000
C1	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C2	Capacitor, .22 UF, 35 V, T368	0283510005
C3	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C4	Capacitor, .22 UF, 35 V, T368	0283510005
C5	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C6	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C7	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C8	Capacitor, 6.8 UF, 20 V, T368	0296780006
C9	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C10	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C11	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C12	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C13	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C14	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C15	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C16	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C17	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C18	Capacitor, 0.1 UF, 12 V, Y5 F, 20%	0270100008
C19	Capacitor, .47 UF, 35 V, T368	0279170009
C20	Capacitor, .22 UF, 35 V, T368	0283510005
C21	Capacitor, 0.1 UF, 12 V, Y5 F, 20%	0270100008
C22	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C23	Capacitor, 0.1 UF, 12 V, Y5 F, 20%	0270100008
C24	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C25	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C26	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C27	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C28	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C29	Not used	
C30	Not used	
C31	Not used	
C32	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C33	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C34	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C35	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C36	Capacitor, 50 UF, 50 V, 30 D	0247070009
C37	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C38	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C39	Capacitor, 50 UF, 50 V, 30 D	0247070009
C40	Capacitor, .47 UF, 35 V, T368	0279170009
C41	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C42	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C43	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C44	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C45	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C46	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C47	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C48	Not used	
C49	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C50	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C51	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C52	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C53	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C54	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C55	Capacitor, 1 UF, 35 V, T368	0283630001
C56	Capacitor, 1 UF, 35 V, T368	0283630001
C57	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
CR1	Diode, Signal, Germ. 1N270	0405510004
CR2	Diode, Signal, Germ. 1N270	0405510004
CR3	Diode, Rectifier 1N4004	0405180004
CR4	Diode, Signal, Germ. 1N270	0405510004
CR5	Diode, Signal, Germ. 1N270	0405510004
CR6	Diode, Signal, Germ. 1N270	0405510004
CR7	Diode, Rectifier 1N4004	0405180004
CR8	Diode, Rectifier 1N4004	0405180004
CR9	Diode, Rectifier 1N4004	0405180004
CR10	Diode, Rectifier 1N4004	0405180004
CR11	Diode, Rectifier 1N4004	0405180004
CR12	Diode, Rectifier 1N4004	0405180004
CR13	Diode, Rectifier 1N4004	0405180004
CR14	Diode, Rectifier 1N4004	0405180004
CR15	Diode, Rectifier 1N4004	0405180004
CR16	Diode, Rectifier 1N4004	0405180004

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
Q1	Transistor, PNP, Si. 2N290A	0448390001
Q2	Transistor, PNP, Si. 2N290A	0448390001
Q3	Transistor, PNP, Si. 2N290A	0448390001
Q4	Transistor, PNP, Si. 2N290A	0448390001
Q5	Transistor, PNP, Si. 2N290A	0448390001
Q6	Transistor, PNP, Si. 2N290A	0448390001
Q7	Transistor, PNP, Si. 2N290A	0448390001
Q8	Transistor, PNP, Si. 2N290A	0448390001
Q9	Transistor, PNP, Si. 2N290A	0448390001
Q10	Transistor, PNP, Si. 2N4126	0448020009
Q11	Transistor, PNP, Si. 2N4126	0448020009
Q12	Transistor, PNP, Si. 2N4126	0448020009
Q13	Transistor, PNP, Si. 2N4126	0448020009
Q14	Transistor, N-CH, Fet 3N170	1003980015
Q15	Transistor, P-CH, Fet J176	1003980007
Q16	Transistor, PNP, Si. 2N4126	0448020009
Q17	Transistor, PNP, Si. 2N4126	0448020009
Q18	Transistor, PNP, Si. 2N4126	0448020009
Q19	Transistor, PNP, Si. 2N4126	0448020009
Q20	Transistor, PNP, Si. 2N4126	0448020009
Q21	Transistor, PNP, Si. 2N4126	0448020009
Q22	Transistor, PNP, Si. 2N4126	0448020009
Q23	Transistor, PNP, Si. 2N4126	0448020009
Q24	Transistor, PNP, Si. 2N4126	0448020009
Q25	Transistor, PNP, Si. 2N4126	0448020009
Q26	Transistor, PNP, Si. 2N4126	0448020009
Q27	Transistor, PNP, Si. 2N4126	0448020009
Q28	Transistor, PNP, Si. 2N4126	0448020009
Q29	Transistor, PNP, Si. 2N4126	0448020009
Q30	Transistor, PNP, Si. 2N4126	0448020009
Q31	Transistor, PNP, Si. 2N4126	0448020009
R1	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R2	Resistor, 1 K, 10%, 1/4 W	0171560001
R3	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R4	Resistor, 220, 10%, 1/4 W	0171320000
R5	Resistor, 220, 10%, 1/4 W	0171320000
R6	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R7	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R8	Resistor, 1 K, 10%, 1/4 W	0171560001
R9	Resistor, 1 K, 10%, 1/4 W	0171560001
R10	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R11	Resistor, 1 K, 10%, 1/4 W	0171560001
R12	Resistor, 100 K, 10%, 1/4 W	0170390004
R13	Resistor, 100 K, 10%, 1/4 W	0170390004
R14	Resistor, 100 K, 10%, 1/4 W	0170390004
R15	Resistor, 100 K, 10%, 1/4 W	0170390004
R16	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R17	Resistor, 100 K, 10%, 1/4 W	0170390004
R18	Resistor, 100 K, 10%, 1/4 W	0170390004
R19	Resistor, 100 K, 10%, 1/4 W	0170390004
R20	Resistor, 100 K, 10%, 1/4 W	0170390004
R21	Resistor, 100 K, 10%, 1/4 W	0170390004
R22	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R23	Resistor, 1 K, 10%, 1/4 W	0171560001
R24	Resistor, 1 K, 10%, 1/4 W	0171560001
R25	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R26	Resistor, 820, 10%, 1/2 W	0175600007
R27	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R28	Resistor, 820, 10%, 1/2 W	0175600007
R29	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R30	Resistor, 820, 10%, 1/2 W	017560007
R31	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R30	Resistor, 820, 10%, 1/2 W	0175600007
R31	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R32	Resistor, 820, 10%, 1/2 W	0175600007
R33	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R34	Resistor, 820, 10%, 1/2 W	0175600007
R35	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R36	Resistor, 820, 10%, 1/2 W	0175600007
R37	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R38	Resistor, 820, 10%, 1/2 W	0175600007
R39	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R40	Resistor, 820, 10%, 1/2 W	0175600007
R41	Resistor, 820, 10%, 1/2 W	0175600007

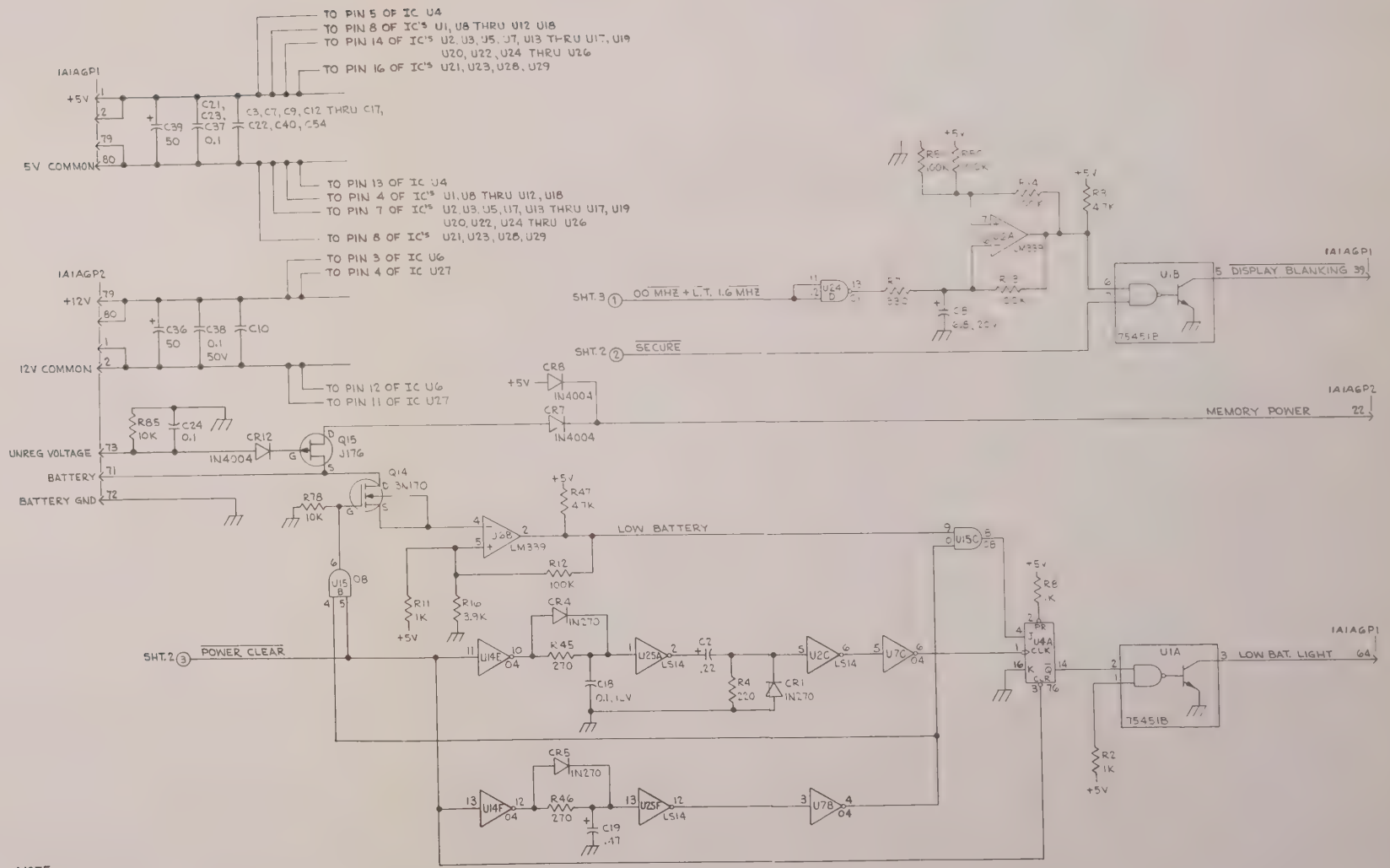
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R42	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R43	Not used	
R44	Resistor, 1 K, 10%, 1/4 W	0171560001
R45	Resistor, 270, 10%, 1/4 W	0178450006
R46	Resistor, 270, 10%, 1/4 W	0178450006
R47	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R48	Resistor, 220, 10%, 1/4 W	0171320000
R49	Resistor, 1 K, 10%, 1/4 W	0171560001
R50	Resistor, 100 K, 10%, 1/4 W	0170390004
R51	Resistor, 100 K, 10%, 1/4 W	0170390004
R52	Resistor, 100 K, 10%, 1/4 W	0170390004
R53	Resistor, 47 K, 10%, 1/4 W	0171060008
R54	Resistor, 1 K, 10%, 1/4 W	0171560001
R55	Resistor, 28 K, 1%, 1/8 W	1004050038
R56	Resistor, 31.6 K, 1%, 1/8 W	1004050020
R57	Resistor, 8.45 K, 1%, 1/8 W	1004070021
R58	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R59	Resistor, 220, 10%, 1/4 W	0171320000
R60	Resistor, 220, 10%, 1/4 W	0171320000
R61	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R62	Resistor, 14.3 K, 1%, 1/8 W	1004090013
R63	Resistor, 21.5 K, 1%, 1/8 W	1004060017
R64	Resistor, 28.7 K, 1%, 1/8 W	1004090005
R65	Resistor, 220, 10%, 1/4 W	0171320000
R66	Resistor, 220, 10%, 1/4 W	0171320000
R67	Resistor, 39.2 K, 1%, 1/8 W	1004080034
R68	Resistor, 49.9 K, 1%, 1/8 W	1004080026
R69	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R70	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R71	Resistor, 330, 5%, 1/4 W	0170910008
R72	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R73	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R74	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R75	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R76	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R77	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R78	Resistor, 10 K, 10%, 1/4 W	0170410005
R79	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R80	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R81	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R82	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R83	Resistor, 15 K, 1%, 1/8 W	1004050003
R84	Resistor, 15 K, 1%, 1/8 W	1004050003
R85	Resistor, 10 K, 10%, 1/4 W	0170410005
R86	Resistor, 220, 10%, 1/4 W	0171320000
R87	Resistor, 220, 10%, 1/4 W	0171320000
R88	Resistor, 220, 10%, 1/4 W	0171320000
R89	Resistor, 220, 10%, 1/4 W	0171320000
R90	Resistor, 24.3 K, 1%, 1/8 W	1004060009
R91	Resistor, 21.5 K, 1%, 1/8 W	1004060017
R92	Resistor, 18.2 K, 1%, 1/8 W	1004060025
R93	Resistor, 15.4 K, 1%, 1/8 W	1004060033
R94	Resistor, 36.5 K, 1%, 1/8 W	1004050011
R95	Resistor, 220, 10%, 1/4 W	0171320000
R96	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R97	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R98	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R99	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R100	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R101	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R102	Resistor, 1.8 K, 10%, 1/4 W	0178190004

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R103	Resistor, 220, 10%, 1/4 W	0171320000
R104	Resistor, 220, 10%, 1/4 W	0171320000
R105	Resistor, 220, 10%, 1/4 W	0171320000
R106	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R107	Resistor, 10.7 K, 1%, 1/8 W	1004070012
R108	Resistor, 220, 10%, 1/4 W	0171320000
R109	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R110	Resistor, 13 K, 1%, 1/8 W	1004070004
R111	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R112	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R113	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R114	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R115	Resistor, 7.87 K, 1%, 1/8 W	1004090021
R116	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R117	Resistor, 220, 10%, 1/4 W	0171320000
R118	Resistor, 3.83 K, 1%, 1/8 W	1004090030
R119	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R120	Resistor, 220, 10%, 1/4 W	0171320000
R121	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R122	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R123	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R124	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R125	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R126	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R127	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R128	Resistor, 220, 10%, 1/4 W	0171320000
R129	Resistor, 220, 10%, 1/4 W	0171320000
R130	Resistor, 220, 10%, 1/4 W	0171320000
R131	Resistor, 220, 10%, 1/4 W	0171320000
R132	Resistor, 220, 10%, 1/4 W	0171320000
R133	Resistor, 68.1 K, 1%, 1/8 W	1004080018
R134	Resistor, 86.6 K, 1%, 1/8 W	1004080000
R135	Resistor, 115 K, 1%, 1/8 W	1004070039
U1	IC Digital SN75451BP	1003950035
U2	IC Digital, Hex Inv SN74LS14N	1003940005
U3	IC Digital SN7400N	0448070006
U4	IC Digital SN7476N	0448240009
U5	IC Digital SN7400N	0448070006
U6	IC Linear LM339N	1003970028
U7	IC Digital SN7404N	1003950001
L8	IC Digital SN75451BP	1003950035
U9	IC Digital SN75452BP	1003960014
U10	IC Digital SN75452BP	1003960014
U11	IC Digital SN75452BP	1003960014
U12	IC Digital SN75452BP	1003960014
U13	IC Digital 74LS196N Selected	0448250004
U14	IC Digital SN7404N	1003950001
U15	IC Digital SN7408N	1003950019
U16	IC Digital SN7453N	1003950027
U17	IC Digital SN7430N	0448110008
U18	IC Digital SN75451BP	1003950035
U19	IC Digital SN7432N	1003960006
U20	IC Digital SN7408N	1003950019
U21	IC Band Prom 32X8 Tri State	1004020007
U22	IC Digital 74S196N Selected	0448250004
U23	IC Digital SN74LS365AN	1003880002
U24	IC Digital SN7401N	0448230003
U25	IC Digital, Hex Inv SN74LS14N	1003940005
U26	IC Digital Hex Inv SN74LS14N	1003940005
U27	IC Linear LM324N	1003970001
U28	IC Digital SN7445N	1003960022
U29	IC Digital SN7445N	1003960022



BAND STEERING BOARD ASSEMBLY

1003600051C



NOTE:
1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE IN OHMS 1/4W, ±10%
   ALL CAPACITOR VALUES ARE .01μf
   ALL TRANSISTORS ARE 2N4126
2. ALL INTEGRATED CIRCUIT TYPE NUMBERS ARE PREFIXED WITH '74' EXCEPT IC'S U1, U8 THRU U12, U18.
3. (1) INDICATES CIRCUITRY CONTINUED ON OTHER SHEET.
4. CIRCUITS NOT USED:

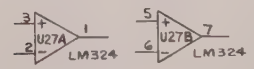


Figure 5.9C Band Steering Schematic

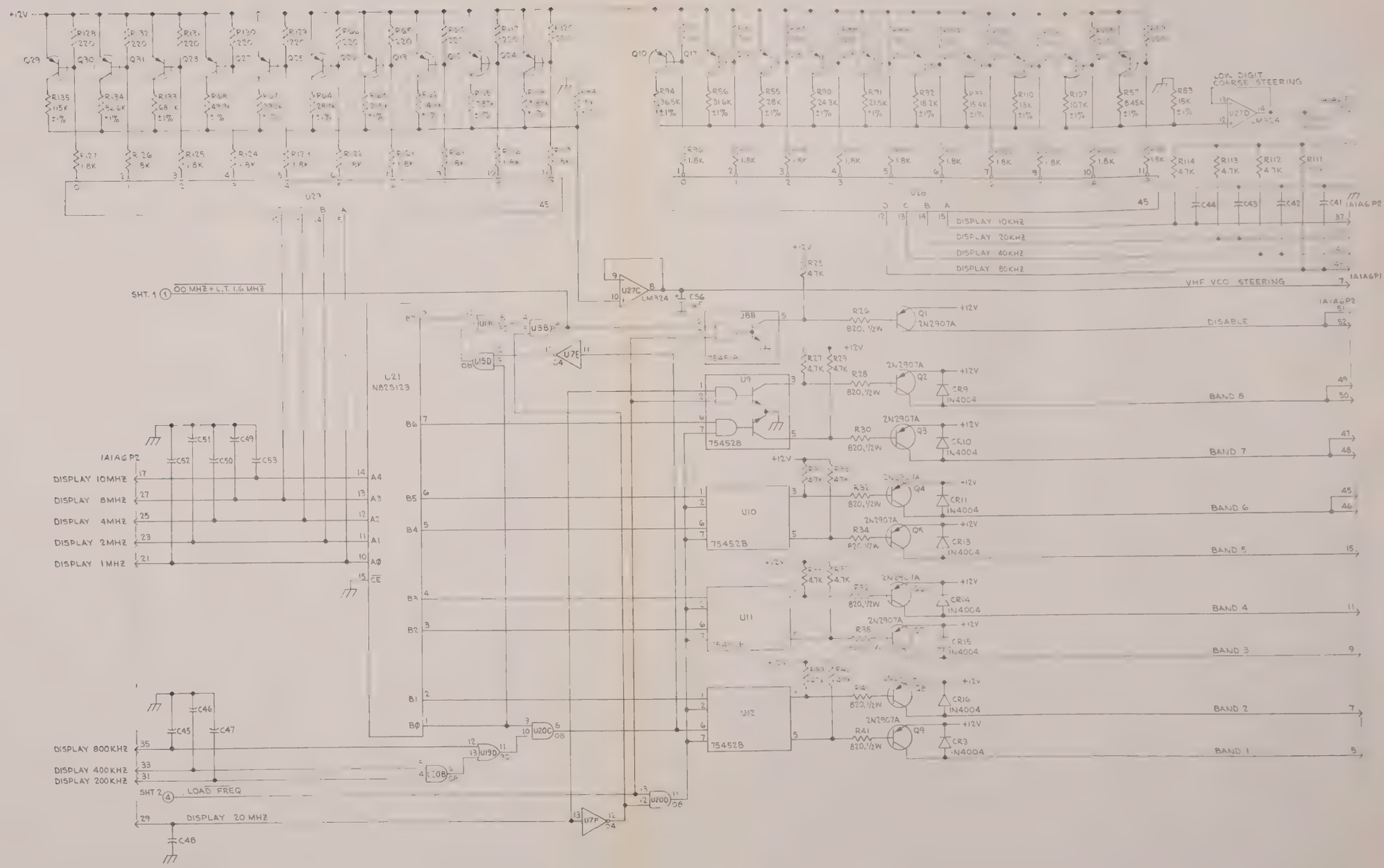


Figure 5.9C Band Steering Schematic (Con't)

1003600051C

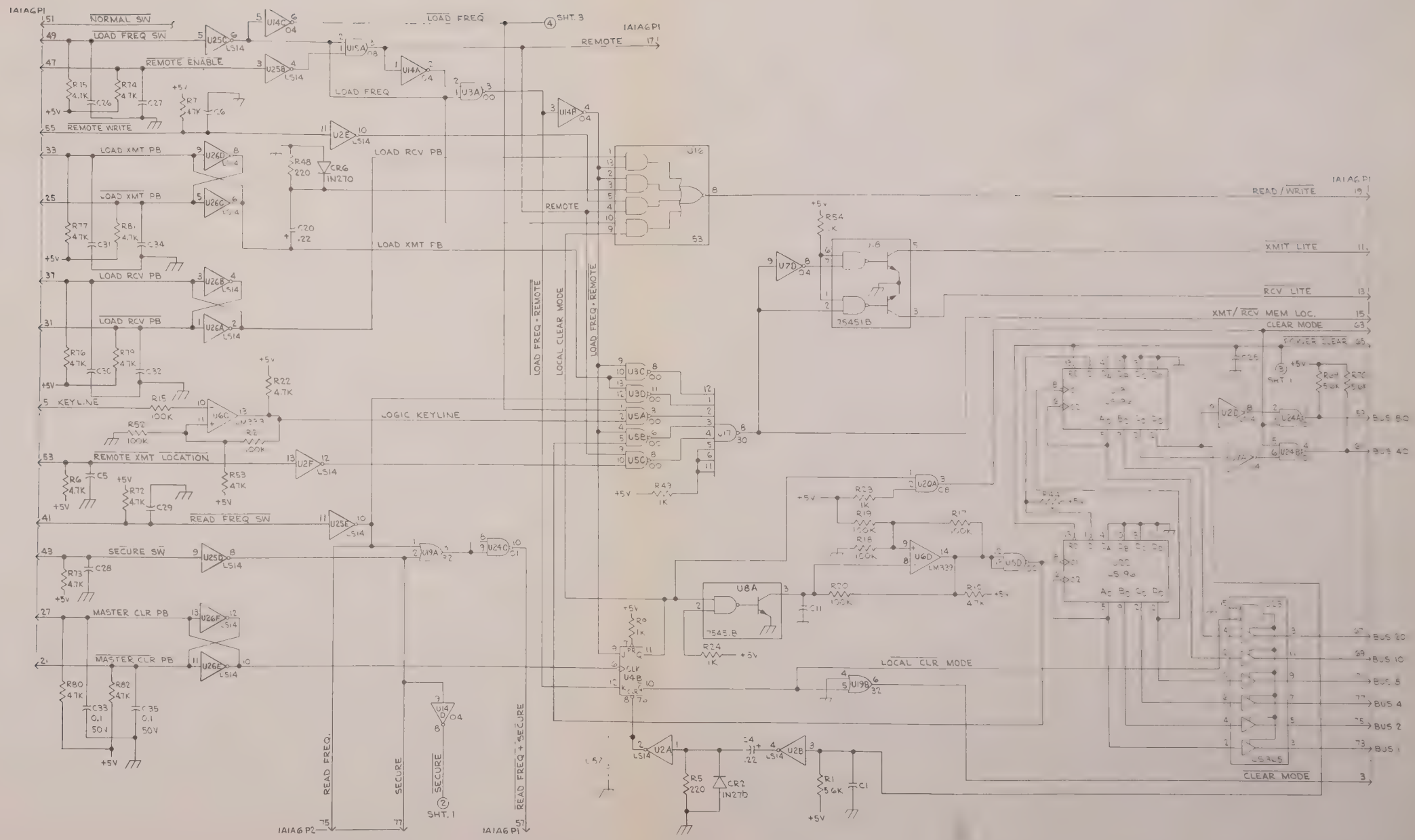
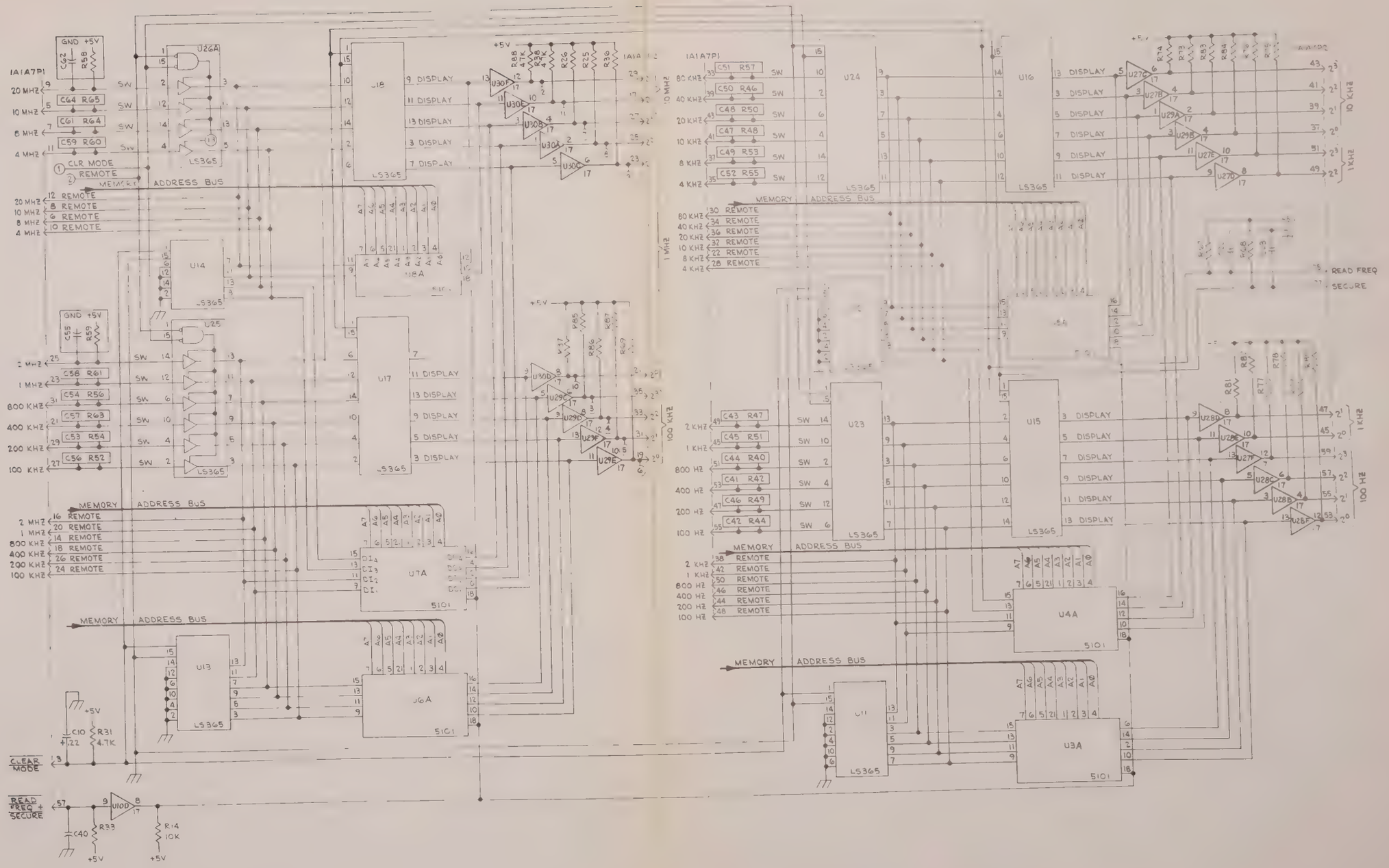
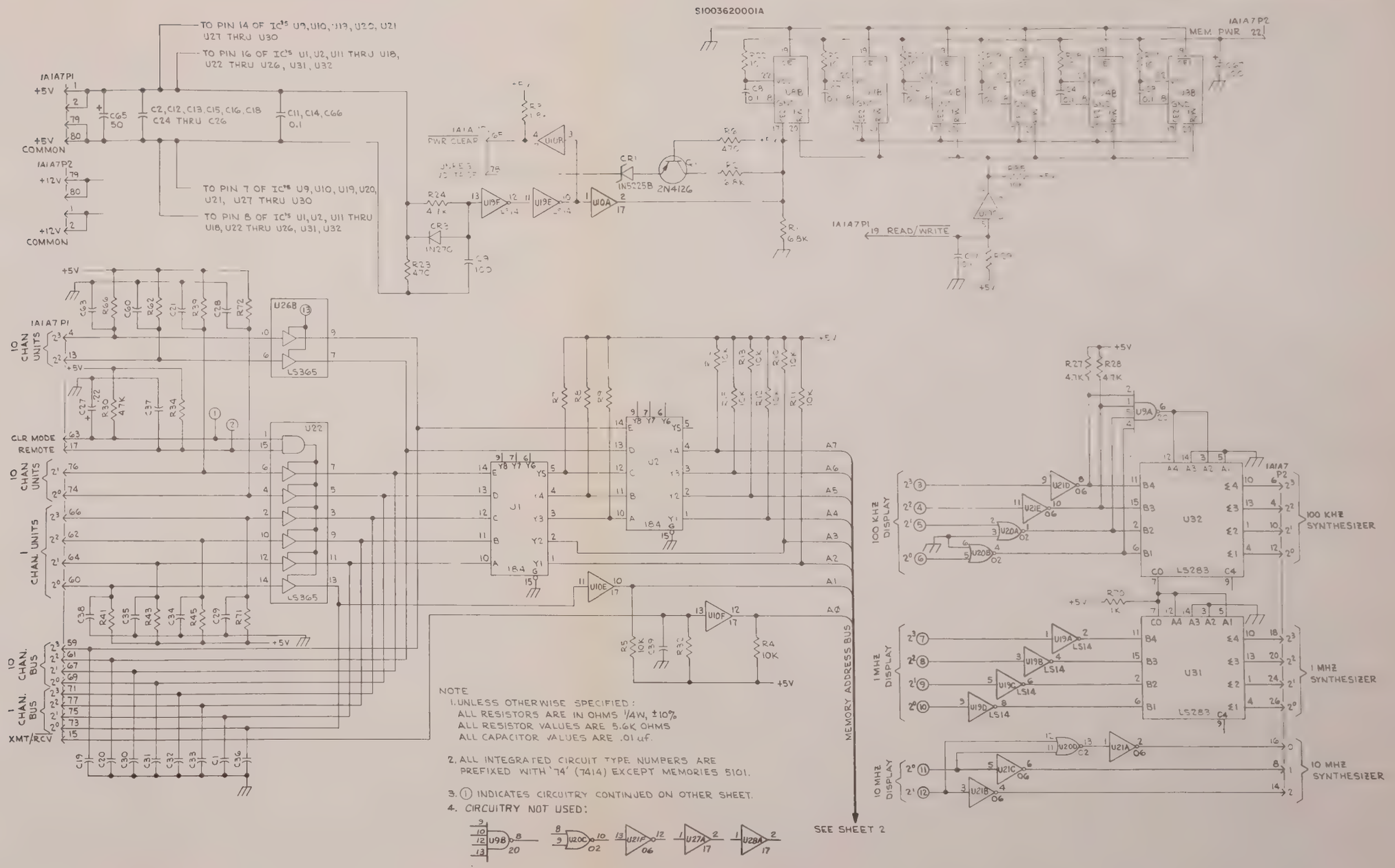


Figure 5.9C Band Steering Schematic (Con't)

S1003620001A



MEMORY BOARD SCHEMATIC



NOTE

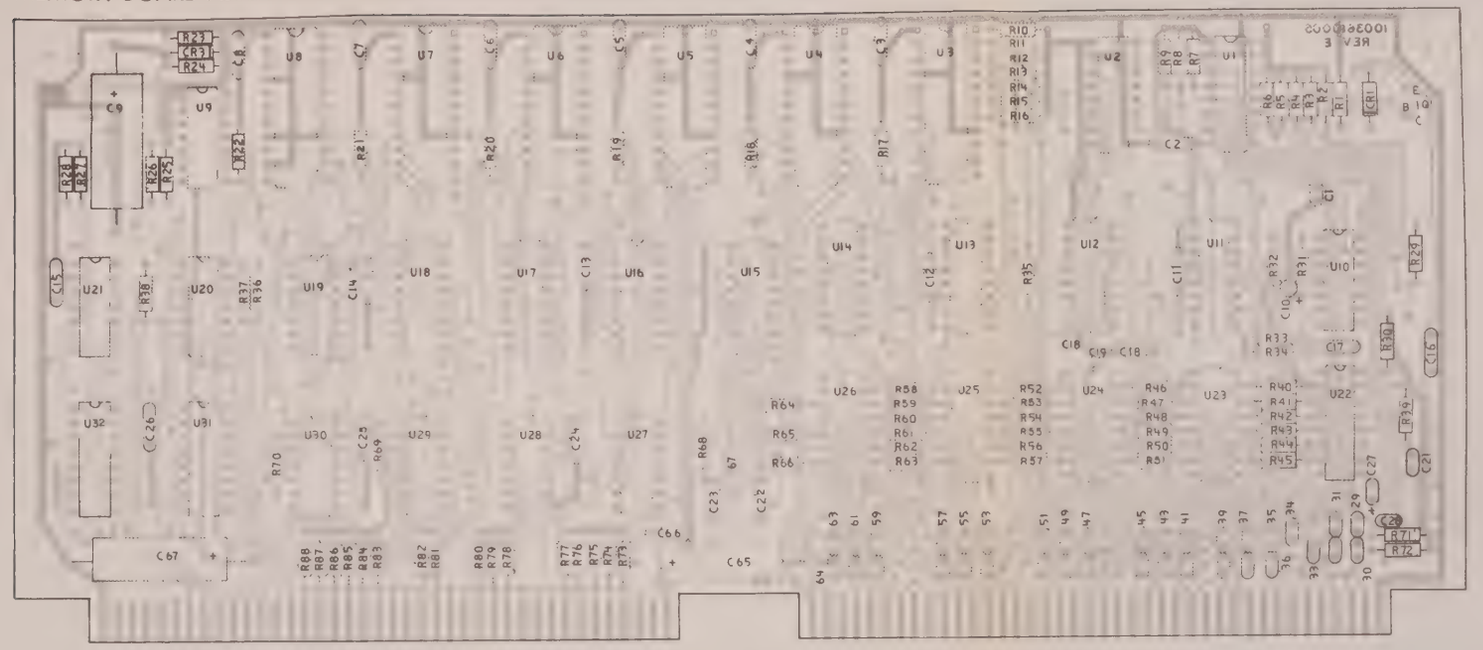
1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE IN OHMS 1/4W, ±10%
   ALL RESISTOR VALUES ARE 5.6K OHMS
   ALL CAPACITOR VALUES ARE .01 uf.
2. ALL INTEGRATED CIRCUIT TYPE NUMPERS ARE PREFIXED WITH '74' (7414) EXCEPT MEMORIES 5101.
3. (1) INDICATES CIRCUITRY CONTINUED ON OTHER SHEET.
4. CIRCUITRY NOT USED:

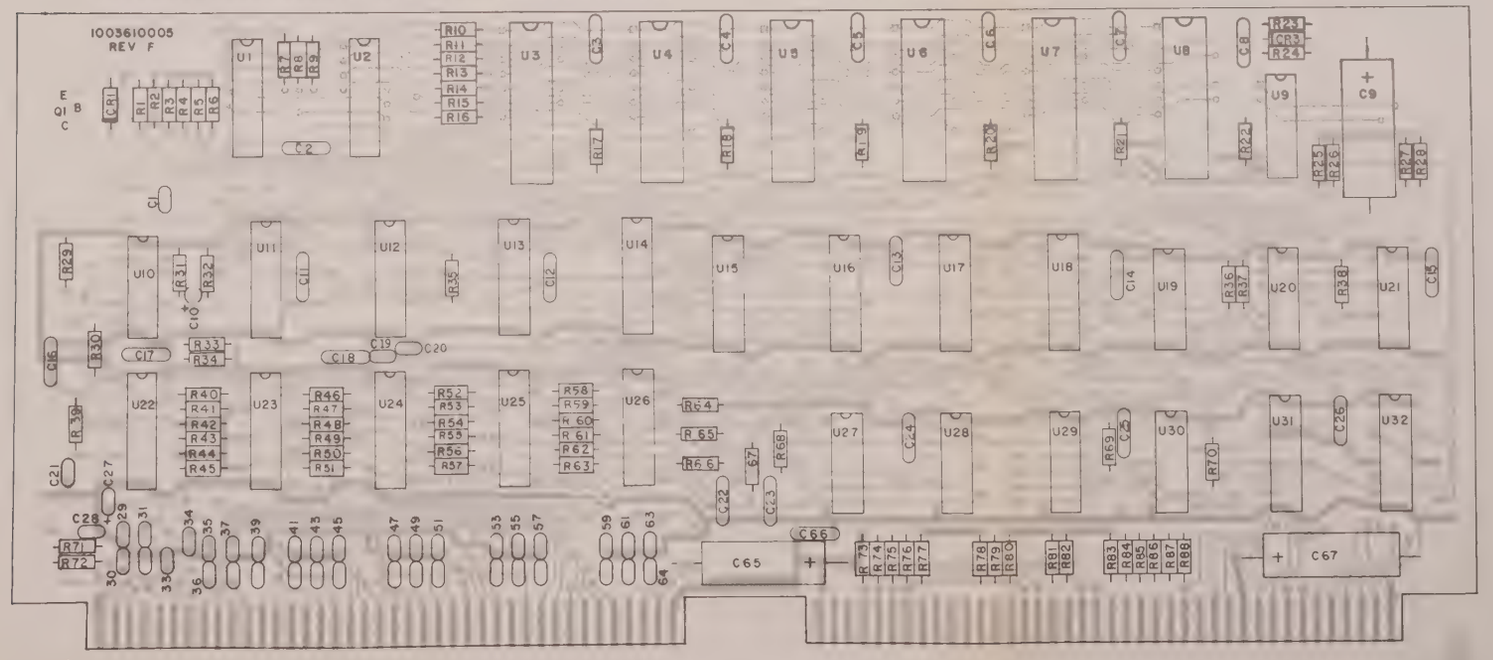
Figure 5.9D Memory Board Schematic

1003620001B PC ASSY MEMORY GSB-900SC

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY MEMORY	1003620001
C1	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C2	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C3	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C4	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C5	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C6	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C7	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C8	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C9	Capacitor, 100 UF, 16 V, NLW	0265970008
C10	Capacitor, .22 UF, 35 V, T368	0283510005
C11	Capacitor, 0.1 UF, 12 V, Y5 F, 20%	0270100008
C12	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C13	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C14	Capacitor, 0.01 UF, 12 V, Y5 F, 20%	0270100008
C15	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C16	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C17	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C18	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C19	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C20	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C21	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C22	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C23	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C24	Capacitor, 0.01 UF, 100 V, Z5 V	0273210000
C25	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C26	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C27	Capacitor, .22 UF, 35 V, T368	0283510005
C28	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0271730008
C29	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C30	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C31	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C32	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C33	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C34	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C35	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C36	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C37	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C38	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C39	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C40	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C41	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C42	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C43	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C44	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C45	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C46	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C47	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C48	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C49	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C50	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C51	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C52	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C53	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C54	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C55	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C56	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C57	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C58	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C59	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C60	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C61	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C62	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C63	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C64	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C65	Capacitor, 50 UF, 50 V, 30 D	0247070009
C66	Capacitor, 0.1 UF, 12 V, Y5 F, 20%	0270100008
C67	Capacitor, 100 UF, 16 V, NLW	0265970008
CR1	Diode, Zener, 1N5225B	0405520000
CR2	Not used	
CR3	Diode, Signal, Germ. 1N270	0405510004
Q1	Transistor, PNP, Si. 2N4126	0448020009
R1	Resistor, 6.8K , 5%, 1/4 W	0174810008
R2	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R3	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R4	Resistor, 10 K, 10%, 1/4 W	0170410005
R5	Resistor, 10 K, 10%, 1/4 W	0170410005
R6	Resistor, 470 , 10%, 1/4 W	0172610001
R7	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R8	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R9	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R10	Resistor, 10 K, 10%, 1/4 W	0170410005
R11	Resistor, 10 K, 10%, 1/4 W	0170410005
R12	Resistor, 10 K, 10%, 1/4 W	0170410005
R13	Resistor, 10 K, 10%, 1/4 W	0170410005
R14	Resistor, 10 K, 10%, 1/4 W	0170410005
R15	Resistor, 10 K, 10%, 1/4 W	0170410005
R16	Resistor, 10 K, 10%, 1/4 W	0170410005
R17	Resistor, 10 , 5%, 1/4 W	0177160004
R18	Resistor, 10 , 5%, 1/4 W	0177160004
R19	Resistor, 10 , 5%, 1/4 W	0177160004
R20	Resistor, 10 , 5%, 1/4 W	0177160004
R21	Resistor, 10 , 5%, 1/4 W	0177160004
R22	Resistor, 10 , 5%, 1/4 W	0177160004
R23	Resistor, 470 , 10%, 1/4 W	0172610001
R24	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R25	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R26	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R27	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R28	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R29	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R30	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R31	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R32	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R33	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R34	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R35	Resistor, 10 K, 10%, 1/4 W	0170410005
R36	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R37	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R38	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R39	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R40	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R41	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R42	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R43	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R44	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R45	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R46	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R47	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R48	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R50	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R51	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R52	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R53	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R54	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R55	Resistor, 5.6 K, 5%, 1/4 W	0192290009
R56	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R57	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R58	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R59	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R60	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R61	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R62	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R63	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R64	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R65	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R66	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R67	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R68	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R69	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R70	Resistor, 1 K, 10%, 1/4 W	0171560001
R71	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R72	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R73	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R74	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R75	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R76	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R77	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R78	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R79	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R80	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R81	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R82	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R83	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R84	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R85	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R86	Resistor, 5.6 K, 5%, 1/4 W	0192210009
R87	Resistor, 5.6 K, 5!, 1/4 W	0192210009
R88	Resistor, 4.7 K, 5%, 1/4 W	0170770001
U1	IC Digital, Convert. SN74184N	1003930000
U2	IC Digital, Convert. SN74184N	1003930000
U3	IC Digital, 256 X4 RAM	1003860001
U4	IC Digital, 256 X4 RAM	1003860001
U5	IC Digital, 256 X4 RAM	1003860001
U6	IC Digital, 256 X4 RAM	1003860001
U7	IC Digital, 256 X4 RAM	1003860001
U8	IC Digital, 256 X4 RAM	1003860001
U9	IC Digital Dual 4 IN SN7420N	1003920004
U10	IC Digital, Hex Driv. SN7417N	1003870007
U11	IC Digital SN74LS365AN	1003880002
U12	IC Digital SN74LS365AN	1003880002
U13	IC Digital SN74LS365AN	1003880002
U14	IC Digital SN74LS365AN	1003880002
U15	IC Digital SN74LS365AN	1003880002
U16	IC Digital SN74LS365AN	1003880002
U17	IC Digital SN74LS365AN	1003880002
U18	IC Digital SN74LS365AN	1003880002
U19	IC Digital, Hex Inv. SN74LS14N	1003940005
U20	IC Digital, Quad. 2 IN SN7402N	1003910009
U21	IC Digital Hex Inv. SN7406N	1003900003
U22	IC Digital SN74LS365AN	1003880002
U23	IC Digital SN74LS365AN	1003880002
U24	IC Digital SN74LS365AN	1003880002
U25	IC Digital SN74LS365AN	1003880002
U26	IC Digital SN74LS365AN	1003880002
U27	IC Digital, Hex Driv. SN7417N	1003870007
U28	IC Digital, Hex Driv. SN7417N	1003870007
U29	IC Digital, Hex Driv. SN7417N	1003870007
U30	IC Digital, Hex Driv. SN7417N	1003870007
U31	IC Digital SN74LS283N	1003890008
U32	IC Digital SN74LS283N	1003890008

MEMORY BOARD ASSEMBLY





PARTS LIST, MAIN FRAME

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Disc. Ceramic, .01 UF, 25 V	0281620008
C2	Capacitor, Disc. Ceramic, .01 UF, 25 V	0281620008
C3	Capacitor, Mylar, 2 UF, 10%, 100 V	0272420000
C5	Capacitor, Disc. Ceramic, .01 UF, 1 KV	0296040002
C6	Capacitor, Disc. Ceramic, .01 UF, 1 KV	0296040002
C7	Capacitor, Disc. Ceramic, .01 UF, 25 V	0281620008
C8	Capacitor, Disc. Ceramic, .01 UF, 25 V	0281620008
C9	Capacitor, Disc. Ceramic, .01 UF, 25 V	0281620008
C10	Capacitor, Disc. Ceramic, .01 UF, 25 V	0281620008
C11	Capacitor, Disc. Ceramic, .01 UF, 25 V	0281620008
CR1	Diode, 1N4004	0405180004
CR2	Diode, 1N4004	0405180004
CR3	Diode, 1N4454	0405270003
CR4	Diode, 1N4454	0405270003
CR5	Diode, 1N4004	0405180004
CR6	Diode, 1N4004	0405180004
J1	Connector, RF-UHF	0753300001
J2	Connector, 10 Pin	0753990008
J3	Connector, 9 Pin	0753440008
J4	Connector, 37 Pin	0753430002
J5	Connector, 11 Pin	0753460009
J6	Connector, 24 Pin	0753510006
J7	Connector, 36 Pin	0753520001
J8	Socket, 7 Pin	[illegible]
K1	Relay, 4 PDT, 12 VDC	0666640008
K2	Relay, 3 PDT, 12 VDC	0666640009
L1	Inductor, 47 UH 5%	0652680003
Q1	Transistor, TIP32A	0448200007
R1	Resistor, Carbon, 3.9 ohm 5%, 1/2 W	0168270005
R2	Resistor, Carbon, 2.2 K, 10%, 1W	0164510001
U1	TCXO	5024012700
	MISCELLANEOUS MECHANICAL PARTS	
J9	Socket, Relay (K1)	0767000005
J10	Socket, Relay (K2)	0754330001
P1	Connector, 7 Pin	0753530007
P2	Connector, 20 Pin	0753550008
P3	Connector, RF BNC	0753720001
P4	Connector, RF BNC	0753720001
P5	Connector, RF BNC	0753710005

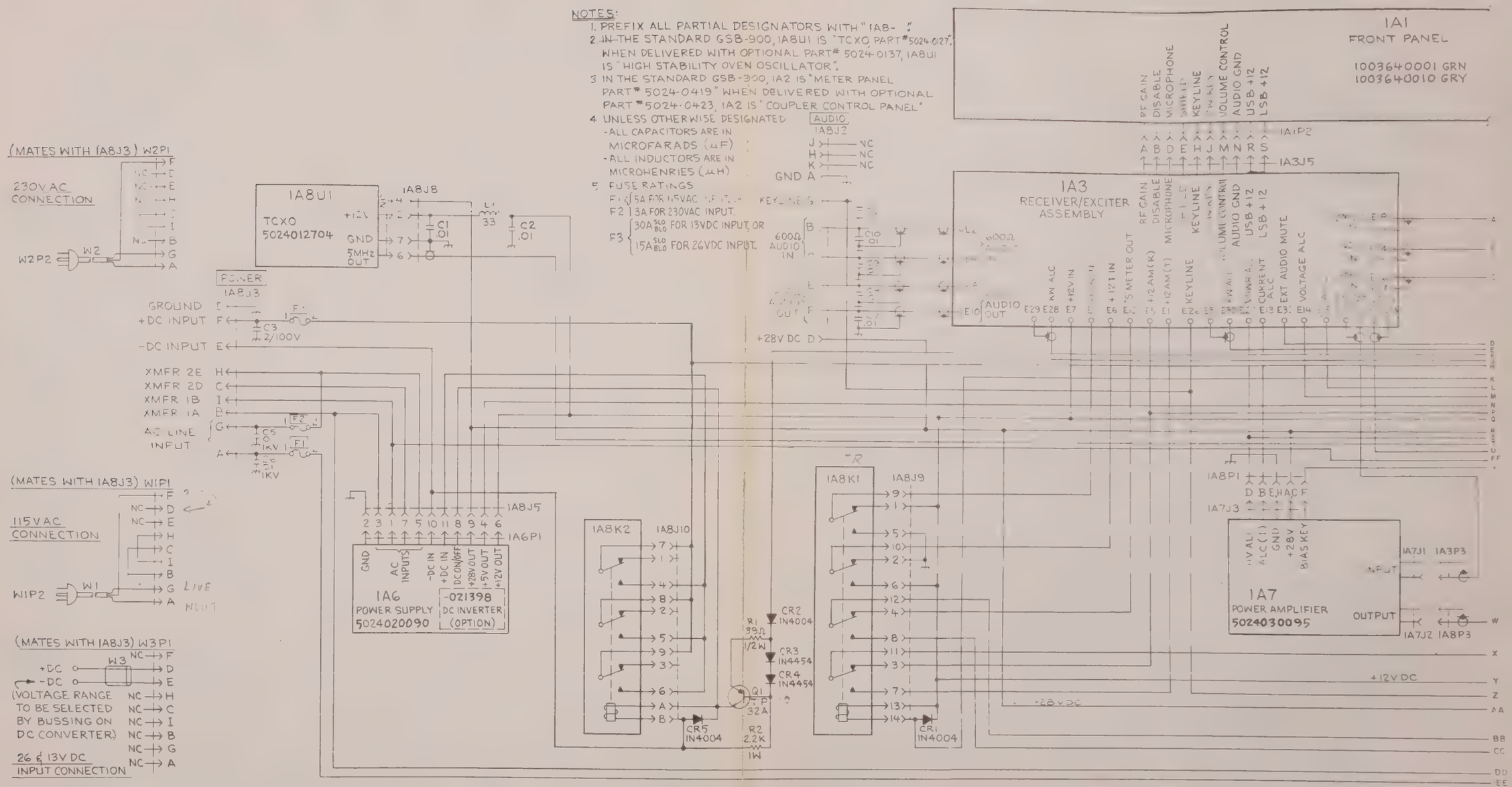


Figure 5.10 Main Frame Wiring

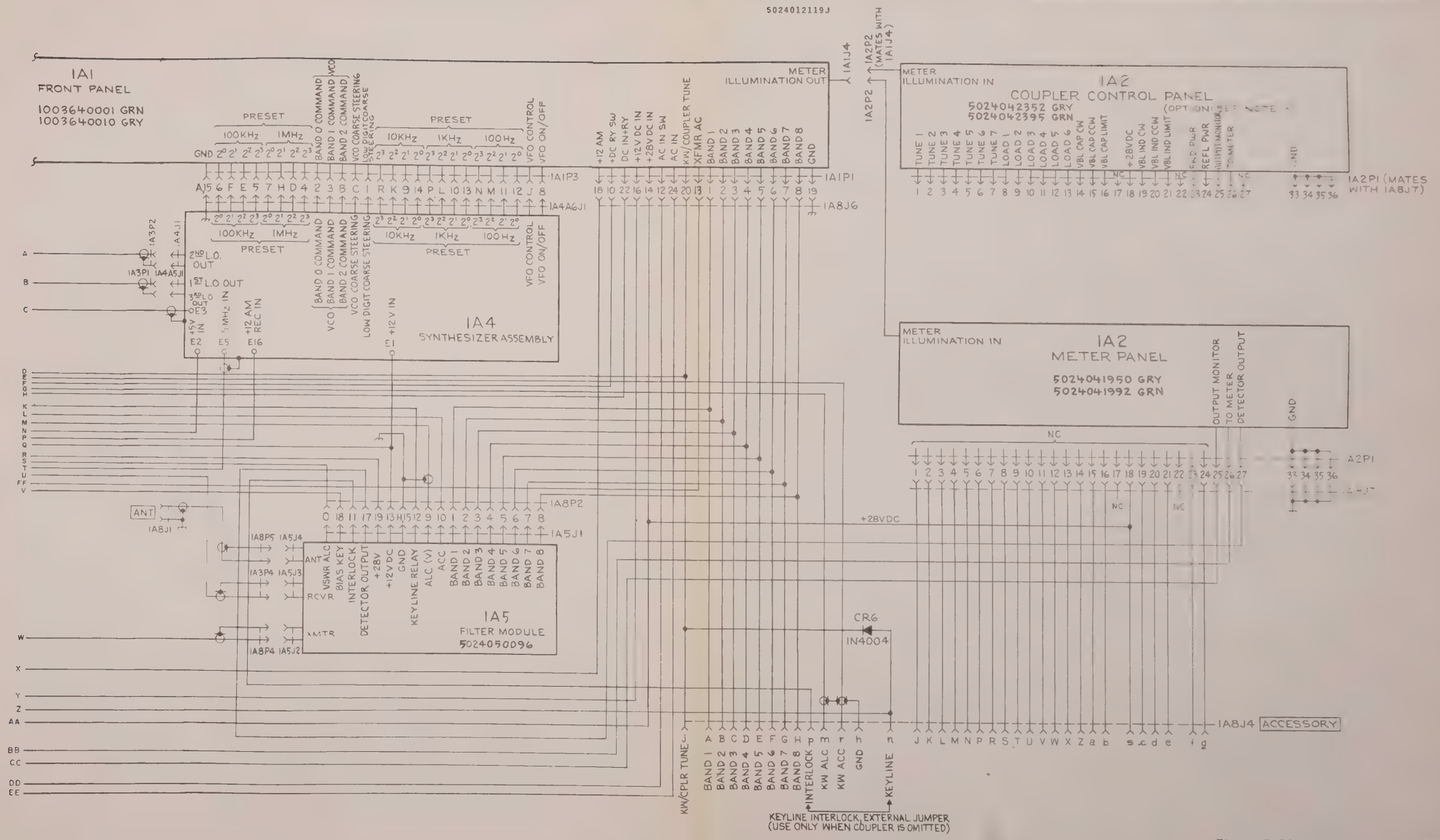


Figure 5.10 Main Frame Wiring

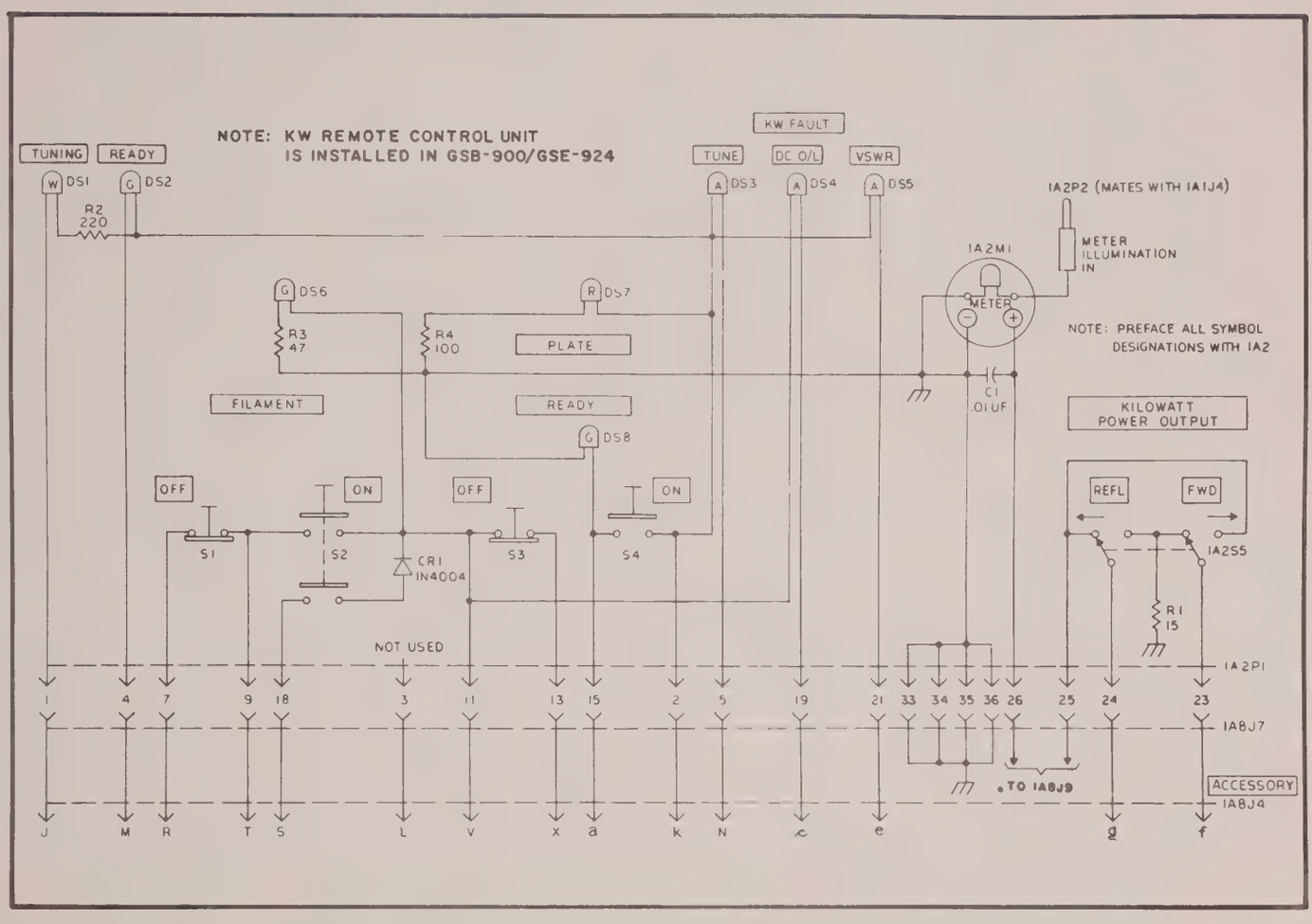


Figure 5.10A KW Remote Control (1A2) Schematic

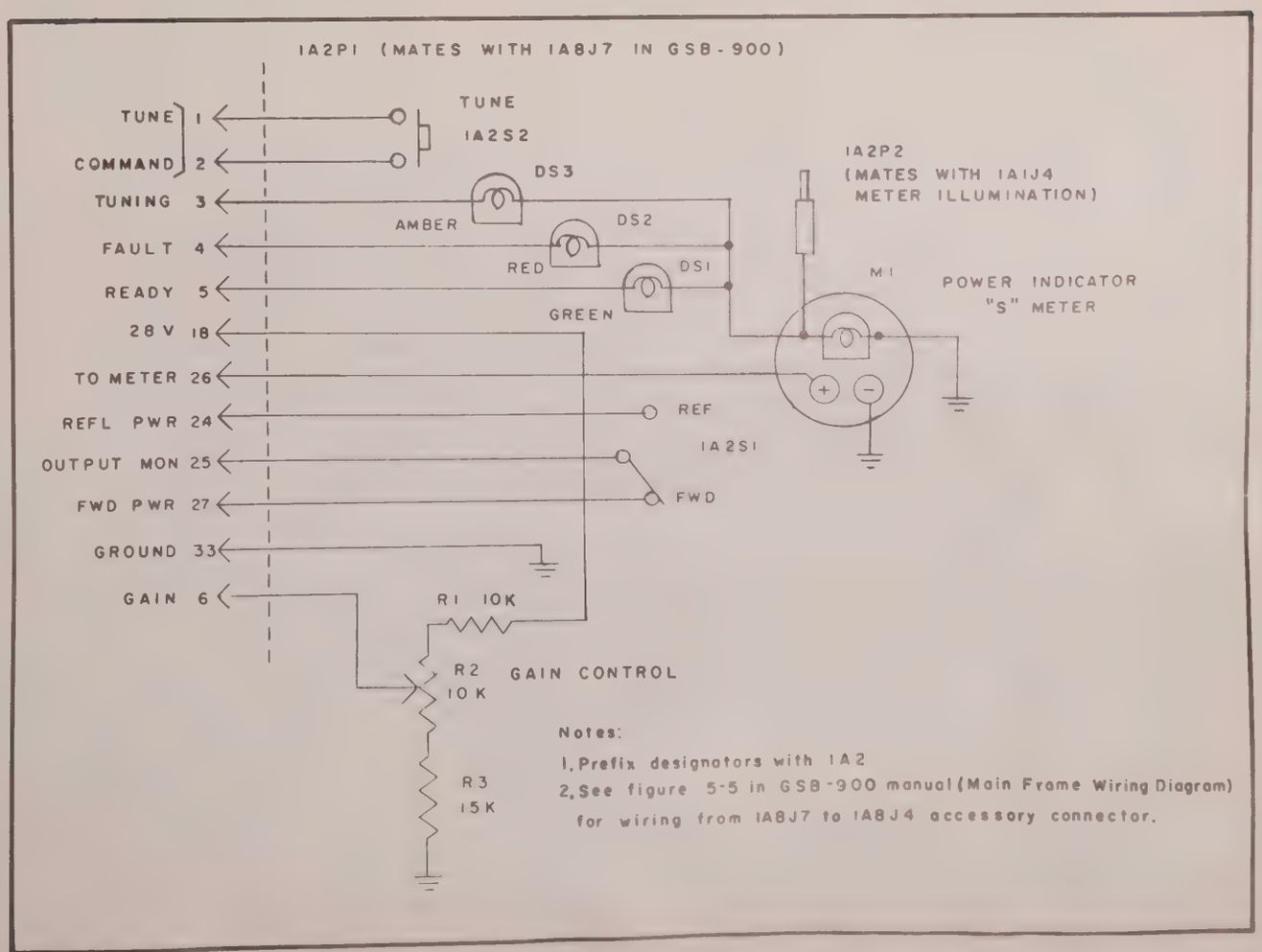
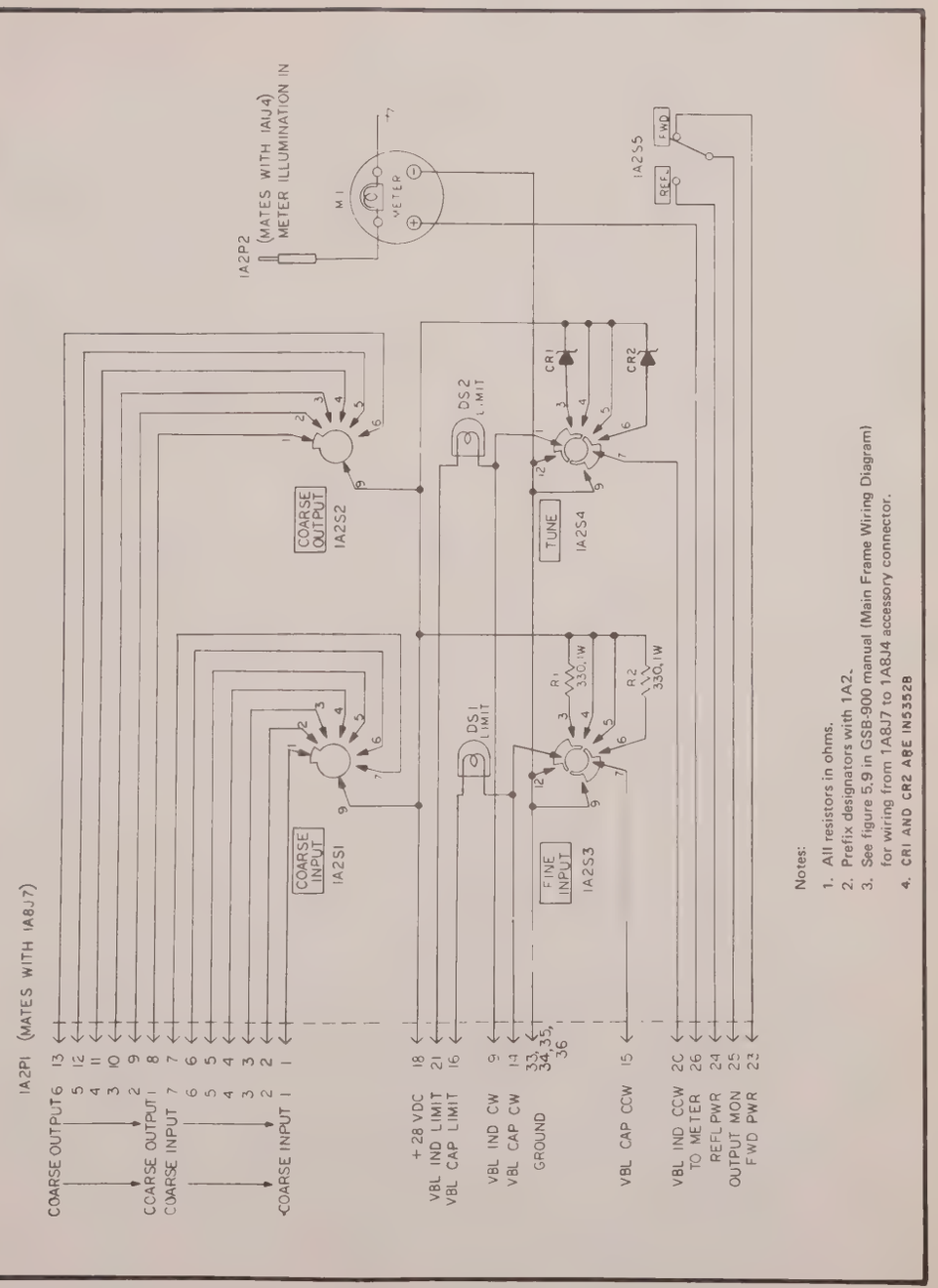


Figure 5.10B Schematic Diagram GCU-935 Antenna Tuning Control Unit



Notes:
1. All resistors in ohms.
2. Prefix designators with 1A2.
3. See figure 5.9 in GSB-900 manual (Main Frame Wiring Diagram) for wiring from 1A8J7 to 1A8J4 accessory connector.
4. CR1 AND CR2 ARE IN5352B

Figure 5.10C Schematic: Antenna Tuning Control Unit

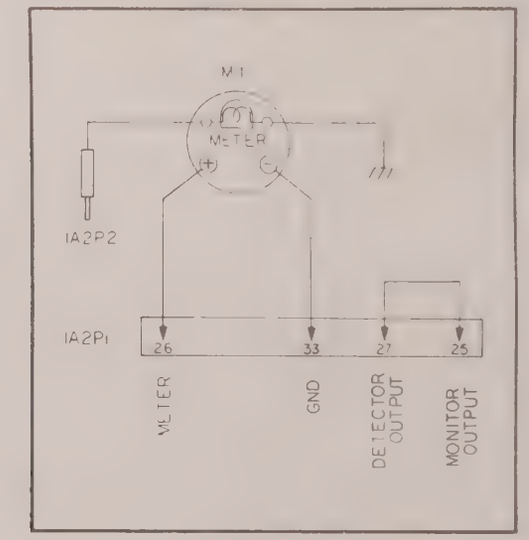
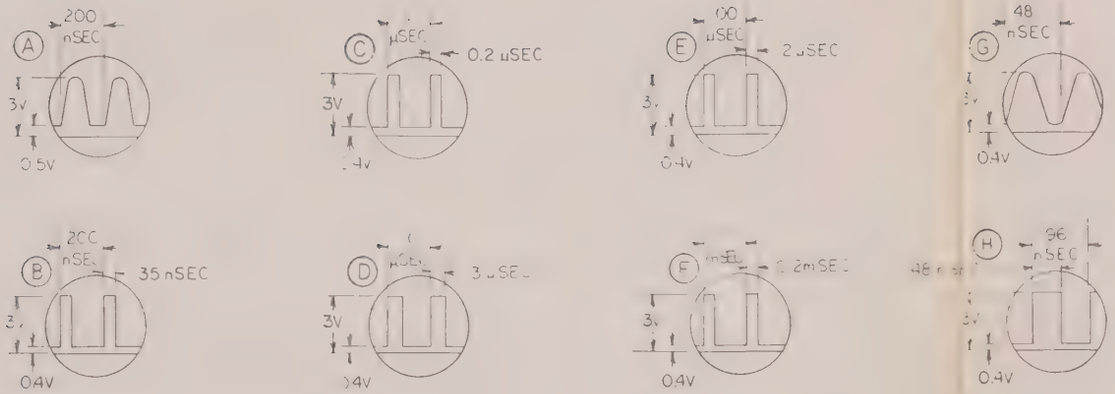


Figure 5.11 Meter Panel Schematic (1A2)

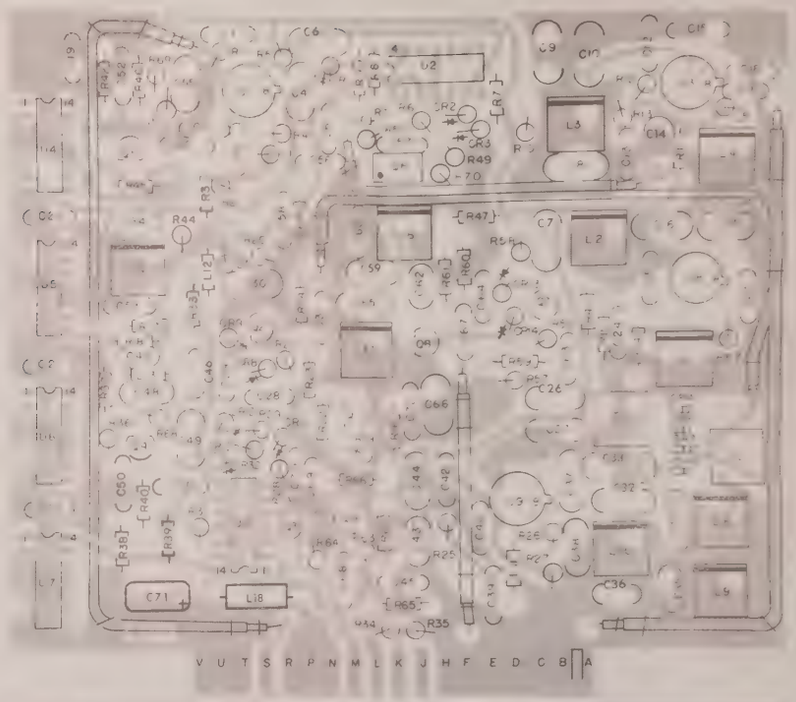
50240419XXE METER PANEL ASSY.

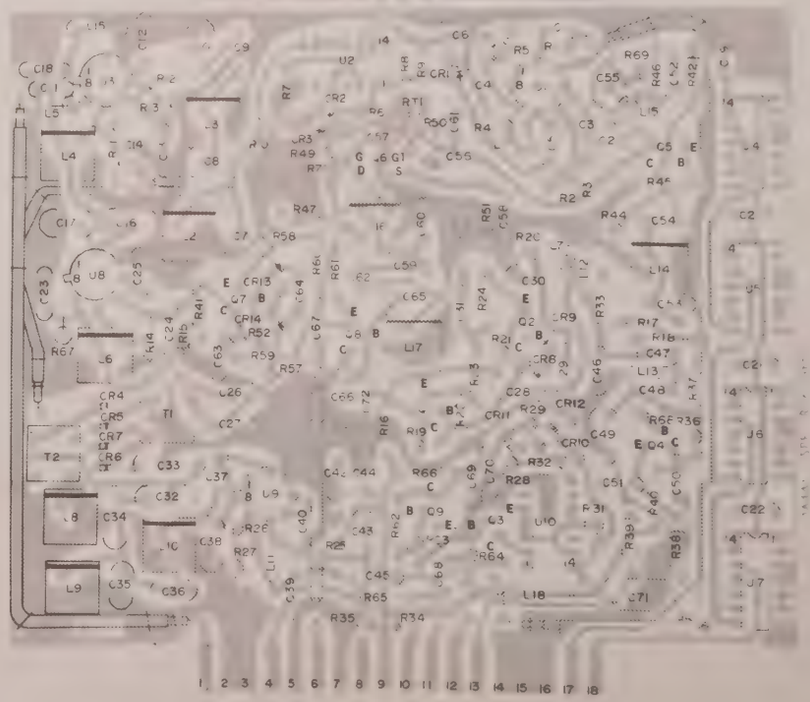
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
M1	Meter, Illuminated	5024042204
P1	Connector, 36 Pin	0754070000
P2	Plug, Phone Tip, Red	0753680000



NOTE: H DOES NOT CLOCK IN AM RCV. MODE

Spectrum Generator (1A4A1) Waveforms
(Frequency Dials at 00000.0 kHZ





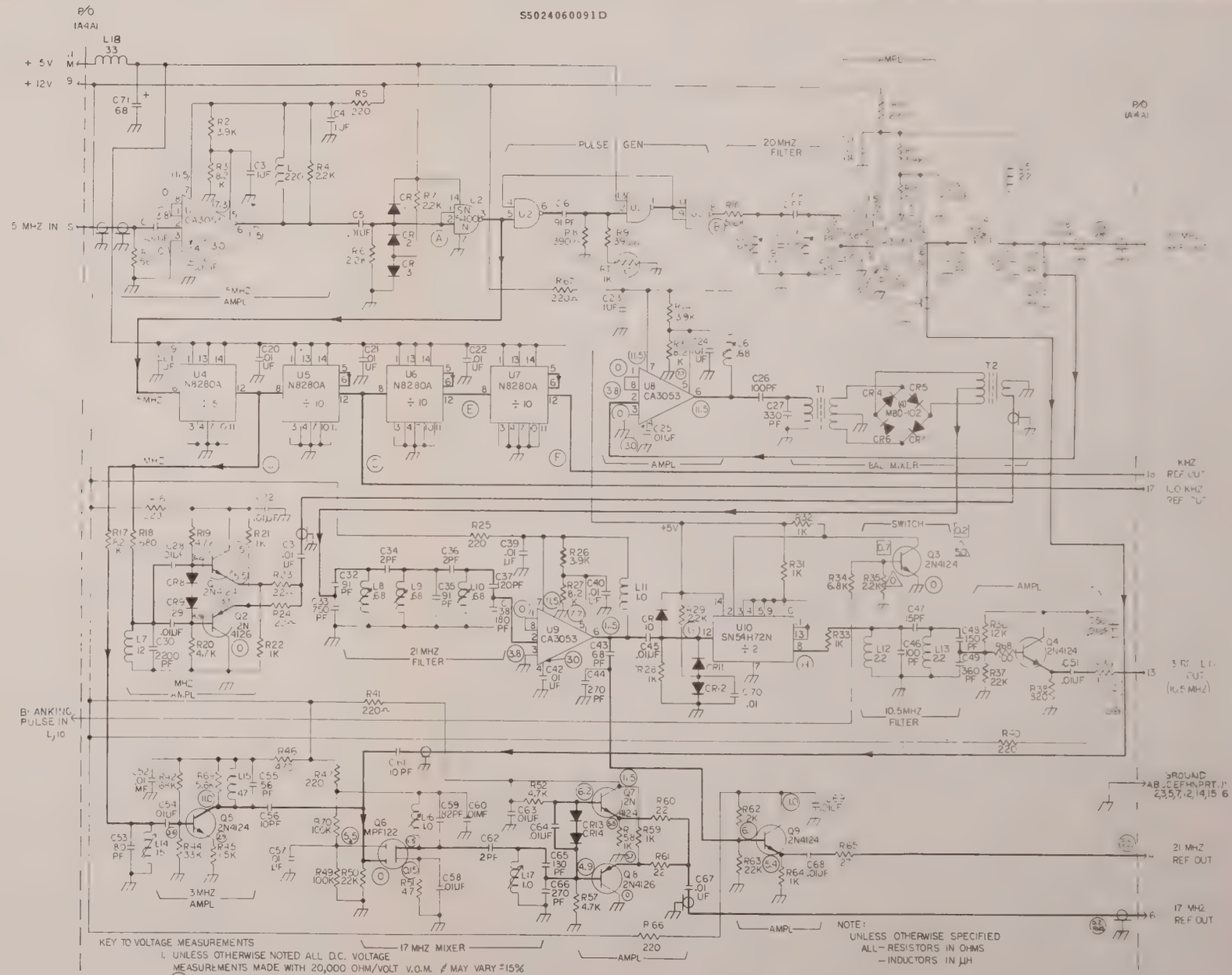
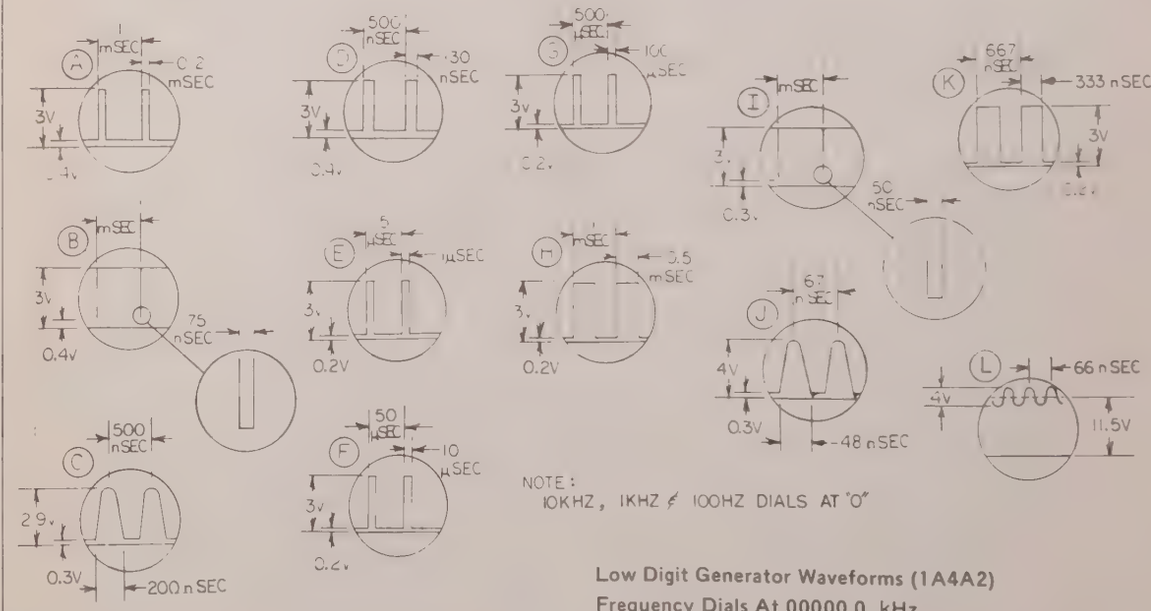


Figure 5.12 Spectrum Generator Schematic (1A4A1)

5024060091K PC ASSY SPECTRUM GENERATOR

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY SPECTRUM GENERATOR	5024060091
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C3	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C4	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C5	Capacitor, 0.01 UF, 25 V, X5S	0283750006
C6	Capacitor, 91 PF, 500 V, DM10, 5%	0284420000
C7	Capacitor, 91 PF, 500 V, DM15, 5%	0284420000
C8	Capacitor, 2 PF, 500 V, DM10	0259710008
C9	Capacitor, 130 PF, 500 V, DM15, 5%	0274860007
C10	Capacitor, 270 PF, 500 V, DM15, 5%	0275030008
C11	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C12	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C13	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C14	Capacitor, 91 PF, 500 V, DM10, 5%	0284420000
C15	Capacitor, 560 PF, 300 V, DM15, 5%	0283750006
C16	Capacitor, 10 PF, 500 V, DM10	0259830003
C17	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007
C18	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C19	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C20	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C21	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C22	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C23	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C24	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C25	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C26	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C27	Capacitor, 330 PF, 500 V, DM15, 5%	0299030008
C28	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C29	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C30	Capacitor, 2200 PF, 500 V, DM19, 2%	0281360006
C31	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C32	Capacitor, 91 PF, 500 V, DM10, 5%	0284420000
C33	Capacitor, 750 PF, 300 V, DM15, 5%	0275410005
C34	Capacitor, 2 PF, 500 V, DM10	0259710008
C35	Capacitor, 91 PF, 500 V, DM10, 5%	0284420000
C36	Capacitor, 2 PF, 500 V, DM10	0259710008
C37	Capacitor, 120 PF, 500 V, DM15, 5%	0289850002
C38	Capacitor, 180 PF, 500 V, DM15, 5%	0258280000
C39	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C40	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C41	Not used	
C42	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C43	Capacitor, 68 PF, 500 V, DM10, 5%	0261070002
C44	Capacitor, 270 PF, 500 V, DM15, 5%	0275030008
C45	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C46	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C47	Capacitor, 15 PF, 500 V, DM10, 5%	0259950009
C48	Capacitor, 150 PF, 500 V, DM15, 5%	0274980002
C49	Capacitor, 360 PF, 500 V, DM15, 5%	0275150003
C50	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C51	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C52	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C53	Capacitor, 180 PF, 500 V, DM15, 5%	0258280000
C54	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C55	Capacitor, 56 PF, 500 V, DM10, 5%	0293170002
C56	Capacitor, 10 PF, 500 V, DM10	0259830003
C57	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C58	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C59	Capacitor, 82 PF, 500 V, DM10, 5%	0262120003
C60	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C61	Capacitor, 10 PF, 500 V, DM10	0259830003
C62	Capacitor, 2 PF, 500 V, DM10	0259710008
C63	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C64	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C65	Capacitor, 130 PF, 500 V, DM15, 5%	0274860007
C66	Capacitor, 270 PF, 500 V, DM15, 5%	0275030008
C67	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C68	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C69	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C70	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C71	Capacitor, 68 UF, 15 V, T368	0296540005
C72	Capacitor, 0.01 UF, 25 V, X5S	0281620008
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003
CR3	Diode, Signal, Sil. 1N4454	0405270003
CR4	Diode, Hot Carrier, MBD-102	0405280009
CR5	Diode, Hot Carrier, MBD-102	0405280009
CR6	Diode, Hot Carrier, MBD-102	0405280009
CR7	Diode, Hot Carrier, MBD-102	0405280009
CR8	Diode, Signal, Sil. 1N4454	0405270003
CR9	Diode, Signal, Sil. 1N4454	0405270003
CR10	Diode, Signal, Sil. 1N4454	0405270003
CR11	Diode, Signal, Sil. 1N4454	0405270003
CR12	Diode, Signal, Sil. 1N4454	0405270003
CR13	Diode, Signal, Sil. 1N4454	0405270003
CR14	Diode, Signal, Sil. 1N4454	0405270003
L1	Inductor, Molded, 220 UH, 5%	0650500008
L2	Inductor, Var. 0.68 UH	0647900009
L3	Inductor, Var. 0.68 UH	0647900009
L4	Inductor, Var. 0.68 UH	0647900009
L5	Inductor, Molded, 22 UH, 5%	0650000005
L6	Inductor, Var. 0.68 UH	0647900009
L7	Inductor, Molded, 12 UH, 5%	0652700004
L8	Inductor, Var. 0.68 UH	0647900009
L9	Inductor, Var. 0.68 UH	0647900009
L10	Inductor, Var. 0.68 UH	0647900009
L11	Inductor, Molded, 1.0 UH, 5%	0649150007
L12	Inductor, Molded, 2.2 UH, 5%	0649890001
L13	Inductor, Molded, 2.2 UH, 5%	0649890001
L14	Inductor, Var. 15.0 UH	0629790001
L15	Inductor, Molded, 47 UH, 5%	0652680003
L16	Inductor, Var, 1.00 UH	0647910004
L17	Inductor, Var, 1.00 UH	0647910004
L18	Inductor, Molded, 33 UH, 5%	0646300008
Q1	Transistor, NPN, Si. 2N4124	0448010003
Q2	Transistor, PNP, Si. 2N4126	0448020009
Q3	Transistor, NPN, Si. 2N4124	0448010003
Q4	Transistor, NPN, Si. 2N4124	0448010003
Q5	Transistor, NPN, Si. 2N4124	0448010003
Q6	Transistor, N-CH, Fet MFE122	0448030004
Q7	Transistor, NPN, Si. 2N4124	0448010003
Q8	Transistor, PNP, Si. 2N4126	0448020009
Q9	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 56, 10%, 1/4W	0174290004
R2	Resistor, 3.9K, 10%, 1/4W	0178830003
R3	Resistor, 8.2K, 10%, 1/4W	0181620006
R4	Resistor, 2.2K, 5%, 1/4W	0178070009
R5	Resistor, 220, 10%, 1/4W	0171320000
R6	Resistor, 2.2K, 5%, 1/4W	0178070009
R7	Resistor, 2.2K, 5%, 1/4W	0178070009
R8	Resistor, 390, 10%, 1/4W	0178330001
R9	Resistor, 390, 10%, 1/4W	0178330001
R10	Resistor, 5.6K, 10%, 1/4W	0183060008
R11	Resistor, 220, 10%, 1/4W	0171320000
R12	Resistor, 3.9K, 10%, 1/4W	0178830003
R13	Resistor, 8.2K, 10%, 1/4W	0181620006
R14	Resistor, 3.9K, 10%, 1/4W	0178830003
R15	Resistor, 8.2K, 10%, 1/4W	0181620006
R16	Resistor, 220, 10%, 1/4W	0171320000
R17	Resistor, 8.2K, 10%, 1/4W	0181620006
R18	Resistor, 680, 10%, 1/4W	0176630007
R19	Resistor, 4.7K, 5%, 1/4W	0170770001
R20	Resistor, 4.7K, 5%, 1/4W	0170770001
R21	Resistor, 1K, 10%, 1/4W	0171560001
R22	Resistor, 1K, 10%, 1/4W	0171560001
R23	Resistor, 22, 10%, 1/4W	0192690001
R24	Resistor, 22, 10%, 1/4W	0192690001
R25	Resistor, 220, 10%, 1/4W	0171320000
R26	Resistor, 3.9K, 10%, 1/4W	0178830003
R27	Resistor, 8.2K, 10%, 1/4W	0181620006
R28	Resistor, 1K, 10%, 1/4W	0171560001
R29	Resistor, 2.2K, 5%, 1/4W	0178070009
R30	Not used	
R31	Resistor, 1K, 10%, 1/4W	0171560001
R32	Resistor, 1K, 10%, 1/4W	0171560001
R33	Resistor, 1K, 10%, 1/4W	0171560001
R34	Resistor, 6.8K, 5%, 1/4W	0174810008
R35	Resistor, 2.2K, 5%, 1/4W	0178070009
R36	Resistor,, 12K, 10%, 1/4W	0183180003
R37	Resistor, 22K, 5%, 1/4W	0172230004
R38	Resistor, 820, 10%, 1/4W	0178210005
R39	Resistor, 10, 5%, 1/4W	0177160004
R40	Resistor, 220, 10%, 1/4W	0171320000
R41	Resistor, 220, 10%, 1/4W	0171320000
R42	Resistor, 68K, 10%, 1/4W	0173520006
R43	Not used	
R44	Resistor, 33K, 10%, 1/4W	0177920009
R45	Resistor, 1.5K, 10%, 1/4W	0172470005
R46	Resistor, 470, 10%, 1/4W	0172610001
R47	Resistor, 220, 10%, 1/4W	0171320000
R48	Not used	
R49	Resistor, 100K, 10%, 1/4W	0170390004
R50	Resistor, 22K, 5%, 1/4W	0172230004
R51	Resistor, 47K, 10%, 1/4W	0179360001
R52	Resistor, 4.7K, 5%, 1/4W	0170770001
R53	Not used	
R54	Not used	
R55	Not used	
R56	Not used	
R57	Resistor, 4.7K, 5%, 1/4W	0170770001
R58	Resistor, 1K, 10%, 1/4W	0171560001
R59	Resistor, 1K, 10%, 1/4W	0171560001
R60	Resistor, 22, 10%, 1/4W	0192690001
R61	Resistor, 22, 10%, 1/4W	0192690001
R62	Resistor, 12K, 10%, 1/4W	0183180003
R63	Resistor, 22K, 5%, 1/4W	0172230004
R64	Resistor, 1K, 10%, 1/4W	0171560001
R65	Resistor, 27, 10%, 1/4W	0172590001
R66	Resistor, 220, 10%, 1/4W	0171320000
R67	Resistor, 220, 10%, 1/4W	0171320000
R68	Resistor, 100, 5%, 1/4W	0171180003
R69	Resistor, 5.6K, 10%, 1/4W	0183060009
R70	Resistor, 100K, 10%, 1/4W	0170390004
RT1	Resistor, 1K at 25C	0196110009
T1	Transformer	5024110307
T2	Transformer	5024110307
U1	IC Digital SN5400N	0448400006
U3	IC Linear CA3053	0448060001
U4	IC Digital SN74176/N8280A	0448080001
U5	IC Digital SN74176/N8280A	0448080001
U6	IC Digital SN74176/N8280A	0448080001
U7	IC Digital SN74176/N8280A	0448080001
U8	IC Linear CA3053	0448060001
U9	IC Linear CA3053	0448060001
U10	IC Digital SN54H72N	0448410001
	Tubing, No. 22 Natural DNP	0579480003
	Wire Kit, Spectrum Gen. Assy.	5024060008
	PCB Spectrum Generator	5024060202



NOTE:
10KHZ, 1KHZ & 100HZ DIALS AT "0"

Low Digit Generator Waveforms (1A4A2)
Frequency Dials At 00000.0 kHz

5024070097C

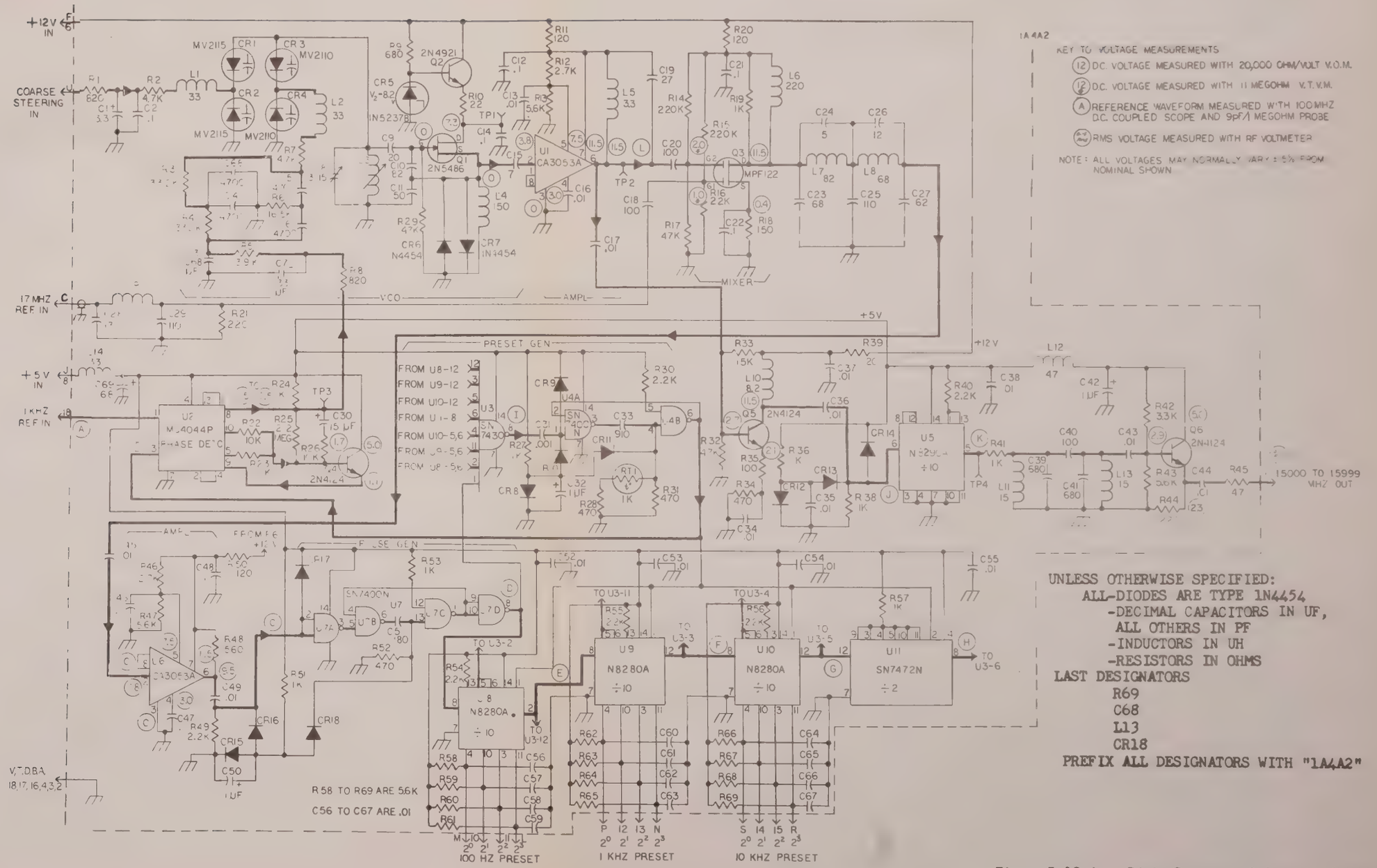


Figure 5.13 Low Digit Generator Schematic (1A4A2)

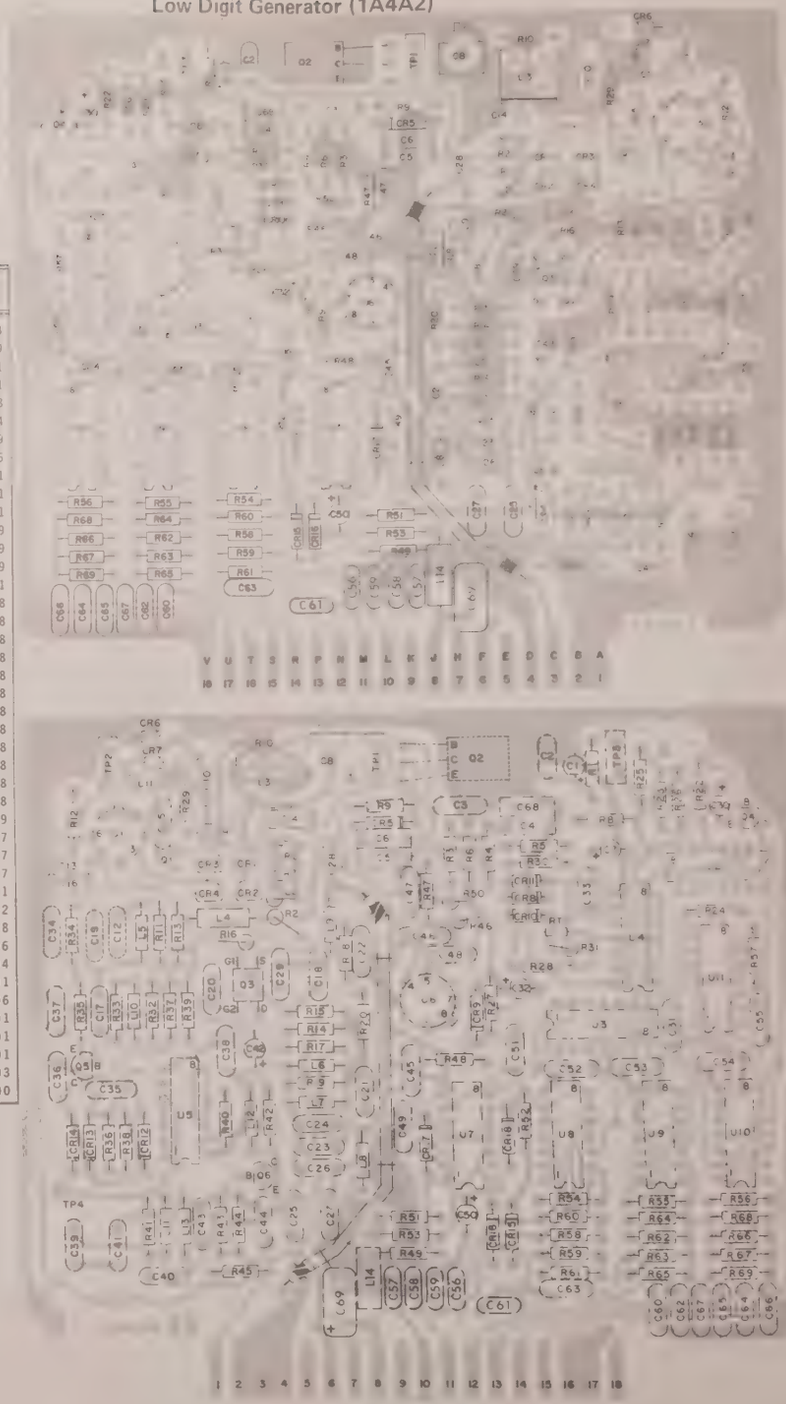
5024070097G PC ASSY LOW DIGIT GENERATOR

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY LOW DIGIT GENERATOR	5024070097
C1	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C2	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C3	Capacitor, .068 UF, 50 V, Mylar	0281640009
C4	Capacitor, 0.0047 UF, 50 V, Mylar	0281540004
C5	Capacitor, 0.0047 UF, 50 V, Mylar	0281540004
C6	Capacitor, 0.0047 UF, 50 V, Mylar	0281540004
C7	Capacitor, 0.33 UF, 35 V, 196 D	0281650004
C8	Capacitor, 3-15 PF, 200 V, N650	0285710001
C9	Capacitor, 120 PF, 500 V, DM15, 5%	0289850002
C10	Capacitor, 82 PF, 500 V, DM10, 5%	0262120003
C11	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C12	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C13	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C14	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C15	Capacitor, 7 PF, 500 V, DM10	0292400004
C16	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C17	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C18	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C19	Capacitor, 27 PF, 500 V, DM10, 5%	0260660001
C20	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C21	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C22	Capacitor, , 0.1 UF, 50 V, X7 R, 20%	0281610002
C23	Capacitor, 68 PF, 500 V, DM10, 5%	0261070002
C24	Capacitor, 5 PF, 500 V, DM10	0261190008
C25	Capacitor, 110 PF, 500 V, DM10, 5%	0257750002
C26	Capacitor, 12 PF, 500 V, DM10, 5%	0260280003
C27	Capacitor, 62 PF, 500 V, DM10, 5%	0283010002
C28	Capacitor, 130 PF, 500 V, DM15, 5%	0274860007
C29	Capacitor, 110 PF, 500 V, DM10, 5%	0257750002
C30	Capacitor, 15 UF, 15 V, 196 D	0281720002
C31	Capacitor, 0.001 UF, 100 V, X7 R, 20%	0281630003
C32	Capacitor, 1 UF, 35 V, 196 D	0281660000
C33	Capacitor, 910 PF, 100 V, CD7, 5%	0288660005
C34	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C35	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C36	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C37	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C38	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C39	Capacitor, 680 PF, 300 V, DM15, 5%	0286240009
C40	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C41	Capacitor, 680 PF, 300 V, DM15, 5%	0286240009
C42	Capacitor, 1 UF, 35 V, 196 D	0281660000
C43	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C44	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C45	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C46	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C47	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C48	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C49	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C50	Capacitor, 1 UF, 35 V, 196 D	0281660000
C51	Capacitor, 180 PF, 500 V, DM15, 5%	0258280000
C52	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C53	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C54	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C55	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C56	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C57	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C58	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C59	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C60	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C61	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C62	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C63	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C64	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C65	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C66	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C67	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C68	Capacitor, 0.0047 UF, 50 V, Mylar	0281540004
C69	Capacitor, 68 UF, 15 V, T368	0296540005
CR1	Diode, Varicap MV2115	0405300000
CR2	Diode, Varicap MV2115	0405300000
CR3	Diode, Varicap MV2110	0405290004
CR4	Diode, VaricapMV2110	0405290004
CR5	Diode, Zener 1N5237B	0405240007

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
CR6	Diode, Signal, Sil. 1N4454	0405270003
CR7	Diode, Signal, Sil. 1N4454	0405270003
CR8	Diode, Signal, Sil. 1N4454	0405270003
CR9	Diode, Signal, Sil. 1N4454	0405270003
CR10	Diode, Signal, Sil. 1N4454	0405270003
CR11	Diode, Signal, Sil. 1N4454	0405270003
CR12	Diode, Signal, Sil. 1N4454	0405270003
CR13	Diode, Signal, Sil. 1N4454	0405270003
CR14	Diode, Signal, Sil. 1N4454	0405270003
CR15	Diode, Signal, Sil. 1N4454	0405270003
CR16	Diode, Signal, Sil. 1N4454	0405270003
CR17	Diode, Signal, Sil. 1N4454	0405270003
CR18	Diode, Signal, Sil. 1N4454	0405270003
L1	Inductor, Molded, 33 UH, 5%	0659690004
L2	Inductor, Molded, 33 UH, 5%	0659690004
L3	Inductor, Var, 1.00 UH	0647910004
L4	Inductor, Molded, 150 UH, 5%	0646780000
L5	Inductor, Molded, 3.3 UH, 5%	0658920006
L6	Inductor, Molded, 220 UH, 5%	0650500008
L7	Inductor, Molded, 82 UH, 5%	0659450003
L8	Inductor, Molded, 68 UH, 5%	0651650003
L9	Inductor, Molded, 1.0 UH, 5%	0649150007
L10	Inductor, Molded, 8.2 UH, 5%	0652060005
L11	Inductor, Molded, 15 UH, 5%	0659070006
L12	Inductor, Molded, 47 UH, 5%	0652680003
L13	Inductor, Molded, 15 UH, 5%	0659070006
L14	Inductor, Molded, 33 UH, 5%	0646300008
Q1	Transistor, N-CH, Fet 2N5486	0448050005
Q2	Transistor, NPN, Si. 2N4921	0448040000
Q3	Transistor, N-CH, Fet MFE122	0448030004
Q4	Transistor, NPN, Si. 2N4124	0448010003
Q5	Transistor, NPN, Si. 2N4124	0448010003
Q6	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 820, 10%, 1/4 W	0178210005
R2	Resistor, 4.7 K, 10%, 1/4 W	0170770001
R3	Resistor, 33.2 K, 1%, 1/8 W	0196470005
R4	Resistor, 33.2 K, 1%, 1/8 W	0196470005
R5	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R6	Resistor, 16.5 K, 1%, 1/8 W	0196590001
R7	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R8	Resistor, 820, 10%, 1/4 W	0178210005
R9	Resistor, 680, 10%, 1/4 W	0176630007
R10	Resistor, 22, 10%, 1/4 W	0192690001
R11	Resistor, 120, 10%, 1/4 W	0186550006
R12	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R13	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R14	Resistor, 220 K, 10%, 1/4 W	0177780002
R15	Resistor, 220 K, 10%, 1/4 W	0177780002
R16	Resistor, 22 K, 5%, 1/4 W	0172230004
R17	Resistor, 47 K, 10%, 1/4 W	0171060008
R18	Resistor, 150, 10%, 1/4 W	0172730007
R19	Resistor, 1 K, 10%, 1/4 W	0171560001
R20	Resistor, 120, 10%, 1/4 W	0186550006
R21	Resistor, 220, 10%, 1/4 W	0171320000
R22	Resistor, 10 K, 10%, 1/4 W	0170410005
R23	Resistor, 10 K, 10%, 1/4 W	0170410005
R24	Resistor, 1 K, 10%, 1/4 W	0171560001
R25	Resistor, 2.2 M, 10%, 1/4 W	0176870008
R26	Resistor, 10 K, 10%, 1/4 W	0170410005
R27	Resistor, 1 K, 10%, 1/4 W	0171560001
R28	Resistor, 470, 10%, 1/4 W	0172610001
R29	Not used	
R30	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R31	Resistor, 470, 10%, 1/4 W	0172610001
R32	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R33	Resistor, 15 K, 10%, 1/4 W	0172350000
R34	Resistor, 470, 10%, 1/4 W	0172610001
R35	Resistor, 100, 5%, 1/4 W	0171180003
R36	Resistor, 1 K, 10%, 1/4 W	0171560001
R37	Not used	
R38	Resistor, 1 K, 10%, 1/4 W	0171560001
R39	Resistor, 120, 10%, 1/4 W	0186550006
R40	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R41	Resistor, 1 K, 10%, 1/4 W	0171560001
R42	Resistor, 3.3 K, 10%, 1/4 W	0170890007

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R43	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R44	Resistor, 220, 10%, 1/4 W	0171320000
R45	Resistor, 47, 10%, 1/4 W	0179360001
R46	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R47	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R48	Resistor, 560, 5%, 1/4 W	0183200004
R49	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R50	Resistor, 120, 10%, 1/4 W	0186550006
R51	Resistor, 1 K, 10%, 1/4 W	0171560001
R52	Resistor, 470, 10%, 1/4 W	0172610001
R53	Resistor, 1 K, 10%, 1/4 W	0171560001
R54	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R55	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R56	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R57	Resistor, 1 K, 10%, 1/4 W	0171560001
R58	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R59	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R60	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R61	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R62	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R63	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R64	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R65	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R66	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R67	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R68	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R69	Resistor, 5.6 K, 10%, 1/4 W	0183060008
RT1	Resistor, 1 K at 25 C	0196110009
TP1	Test Point, White	0753640007
TP2	Test Point, White	0753640007
TP3	Test Point, White	0753640007
U1	IC Linear CA3053	0448060001
U2	IC Digital MC4044P	0448100002
U3	IC Digital SN7430N	0448110008
U4	IC Digital SN7400N	0448070006
U5	IC Digital 74LS196N Selected	0448250004
U6	IC Linear CA3053	0448060001
U7	IC Digital SN7400N	0448070006
U8	IC Digital SN74176/N8280A	0448080001
U9	IC Digital SN74176/N8280A	0448080001
U10	IC Digital SN74176/N8280A	0448080001
U11	IC Digital SN7472N	0448120003
	Terminal, Turret SWGD .071 Mtg	0525580000

Low Digit Generator (1A4A2)



5024080092L PC ASSY TRANSLATOR

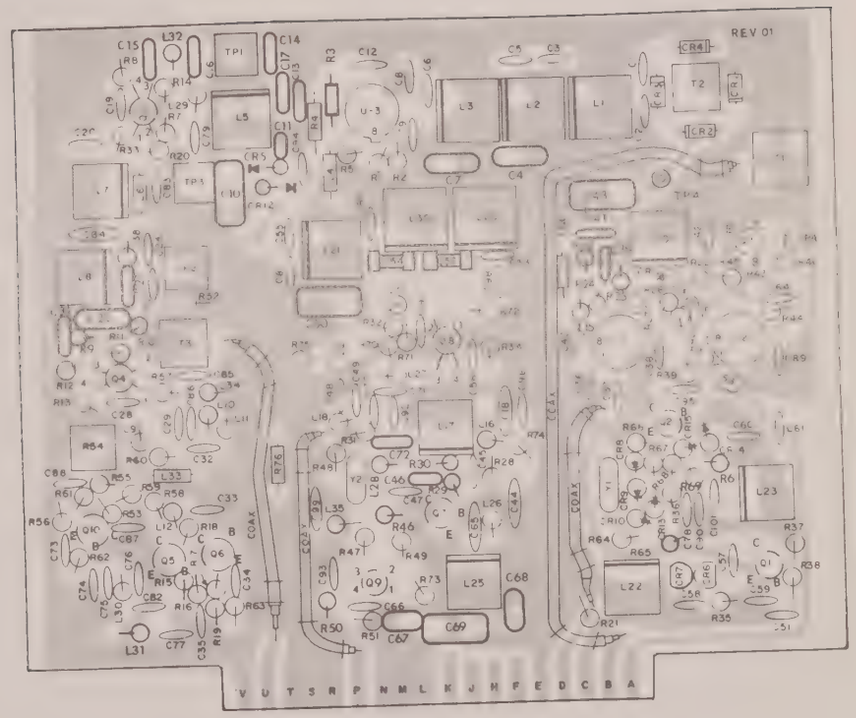
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY TRANSLATOR	5024080092
C1	Capacitor, 82 PF, 300 V, CD6, 5%	0266520006
C2	Capacitor, 820 PF, 100 V, CD7, 5%	0283990007
C3	Capacitor, 2 PF, 500 V, DM10	0259710008
C4	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C5	Capacitor, 2 PF, 500 V, DM10	0259710008
C6	Capacitor, 200 PF, 500 V, DM10, 5%	0293050007
C7	Capacitor, 200 PF, 300 V, CD7, 5%	0287150003
C8	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C9	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C10	Capacitor, 680 PF, 100 V, CD7, 5%	0284280003
C11	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C12	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C13	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C14	Capacitor, 1 PF, 500 V, DM10	0260160008
C15	Capacitor, 20 PF, 500 V, DM10, 5%	0260420000
C16	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C17	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007
C18	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C19	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C20	Capacitor, 18 PF, 500 V, DM10, 5%	0260300004
C21	Capacitor, 1 PF, 500 V, DM10	0260160008
C22	Capacitor, 33 PF, 300 V, CD6, 5%	0286860007
C23	Capacitor, 39 PF, 500 V, DM10, 5%	0293290008
C24	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C25	Not used	
C26	Not used	
C27	Not used	
C28	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C29	Capacitor, 24 PF, 500 V, DM10, 5%	0290060001
C30	Not used	
C31	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C32	Capacitor, 0.01 UF, 50 V, W5 R 20%	0281730008
C33	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C34	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C35	Capacitor, 33 PF, 500 V, DM10, 5%	0260780006
C36	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
R37	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
R38	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
R39	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
R40	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
R41	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C42	Capacitor, 62 PF, 500 V, DM10, 5%	0283010002
C43	Capacitor, 560 PF, 100 V, CD7, 5%	0285690001
C44	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C45	Capacitor, 680 PF, 100 V, CD7, 5%	0284280003
C46	Capacitor, 24 PF, 500 V, DM10, 5%	0290060001
C47	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C48	Capacitor, 200 PF, 500 V, DM10, 5%	0293050007
C49	Capacitor, 120 PF, 500 V, DM10, 2%	0292880006
C50	Capacitor, 470 PF, 100 V, CD7, 5%	0285570005
C51	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C52	Capacitor, 0.5 PF, 500 V, NPO	0281740003
C53	Capacitor, 12 PF, 500 V, DM10, 5%	0260280003
C54	Capacitor, 0.5 PF, 500 V, NPO	0281740003
C55	Capacitor, 10 PF, 500 V, DM10	0259830003
C56	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C57	Capacitor, 56 PF, 500 V, DM10, 5%	0293170002
C58	Capacitor, 180 PF, 500 V, DM10, 5%	0294100008
C59	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C60	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C61	Capacitor, 5 PF, 500 V, DM10, 5%	0261190008
C62	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C63	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C64	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C65	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C66	Capaitor, 270 PF, 300 V, DM10, 5%	0294600001
C67	Capacitor, 18 PF, 500 V, DM10, 5%	0260300004
C68	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C69	Capacitor, 680 PF, 100 V, CD7, 5%	0284280003
C70	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C71	Capacitor, 20 PF, 500 V, DM10, 5%	0260420000
C72	Capacitor, 20 PF, 500 V, DM10, 5%	0260420000
C73	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C74	Capacitor, 15 PF, 500 V, DM10, 5%	0259950009

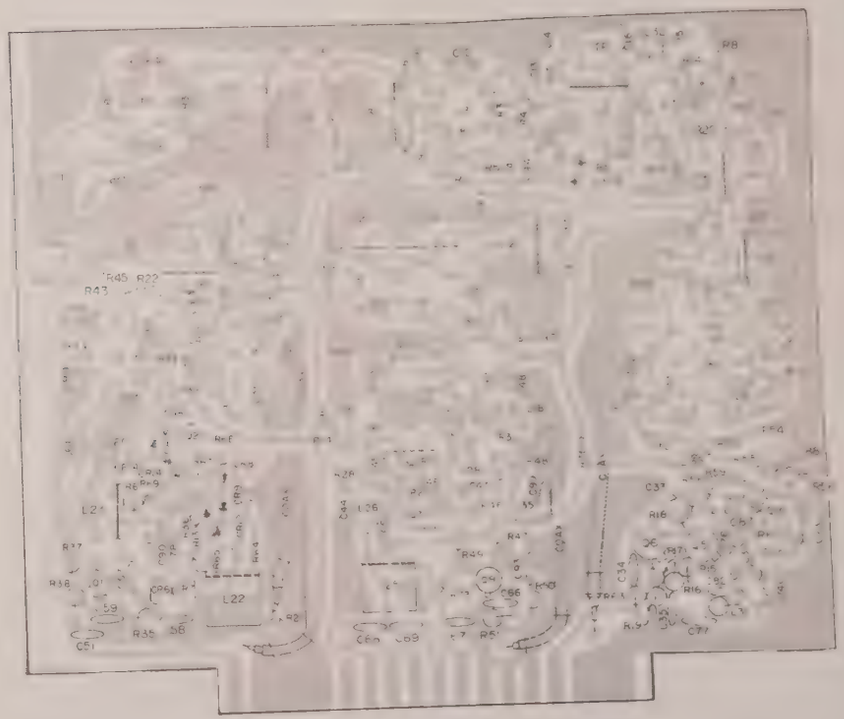
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C75	Capacitor, 1 PF, 500 V, DM10	0260160008
C76	Capacitor, 24 PF, 500 V, DM10, 5%	0290060001
C77	Capacitor, 12 PF, 500 V, DM10, 5%	0260280003
C78	Capacitor, 15 UF, 15 V, 196 D	0281720002
C79	Capacitor, 12 PF, 500 V, DM10, 5%	0260280003
C80	Capacitor, 15 PF, 500 V, DM10, 5%	0259950009
C81	Capacitor, 82 PF, 300 V, CD6, 5%	0266520006
C82	Capacitor, 2 PF, 500 V, DM10	0259710008
C83	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C84	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C85	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C86	Capacitor, 1 PF, 500 V, DM10	0260160008
C87	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C88	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C89	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C90	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C91	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C92	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C93	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C94	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C95	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C96	Capacitor, 120 PF, 500 V, DM10, 2%	0292880006
C97	Not used	
C98	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C99	Capacitor, 200 PF, 500 V, DM10, 5%	0293050007
C100	Not used	
C101	Capacitor, 18 PF, 500 V, DM10, 5%	0260300004
CR1	Diode, Hot Carrier MBD-102	0405280009
CR2	Diode, Hot Carrier MBD-102	0405280009
CR3	Diode, Hot Carrier MBD-102	0405280009
CR4	Diode, Hot Carrier MBD-102	0405280009
CR5	Diode, Signal, Sil. 1N4454	0405270003
CR6	Diode, Varicap MV2106	0405310005
CR7	Diode, Varicap MV2106	0405310005
CR8	Diode, Signal, Sil. 1N4454	0405270003
CR9	Diode, Signal, Sil. 1N4454	0405270003
CR10	Diode, Signal, Sil. 1N4454	0405270003
CR11	Diode, Signal, Sil. 1N4454	0405270003
CR12	Diode, Signal, Sil. 1N4454	0405270003
CR13	Diode, Signal, Sil. 1N4454	0405270003
CR14	Diode, Signal, Sil. 1N4454	0405270003
CR15	Diode, Signal, Sil. 1N4454	0405270003
L1	Inductor, Var, 0.68 UH	0647900009
L2	Inductor, Var, 0.68 UH	0647900009
L3	Inductor, Var, 0.68 UH	0647900009
L4	Inductor, Molded, 22 UH, 5%	0650000005
L5	Inductor, Var, 1.00 UH	0647910004
L6	Inductor, Molded, 4.7 UH, 5%	0651910005
L7	Inductor, Var, 0.18 UH	0674890003
L8	Inductor, Var, 0.18 UH	0674890003
L9	Inductor, Molded, 6.8 UH, 5%	0659210002
L10	Inductor, Molded, 2.2 UH, 10%	0659710005
L11	Inductor, Molded, 8.2 UH, 5%	0652060005
L12	Inductor, Molded, 22 UH, 5%	0650000005
L13	Inductor, Var, 1.00 UH	0647910004
L14	Inductor, Molded, 22 UH, 5%	0650000005
L15	Inductor, Molded, 22 UH, 5%	0650000005
L16	Inductor, Molded, 4.7 UH, 5%	0651910005
L17	Inductor, Var, 0.18 UH	0647890003
L18	Inductor, Molded, 0.68 UH, 5%	0649030001
L19	Inductor, Molded, 4.7 UH, 5%	0651910005
L20	Inductor, Var, 0.18 UH	0647890003
L21	Inductor, Var, 0.18 UH	0647890003
L22	Inductor, Var, 5.60 UH	0647880008
L23	Inductor, Var, 1.00 UH	0647910004
L24	Inductor, Molded, 22 UH, 5%	0650000005
L25	Inductor, Var, 0.18 UH	0647890003
L26	Inductor, Molded, 4.7 UH, 5%	0651910005
L27	Inductor, Molded, 0.18 UH, 10%	0651890004
L28	Inductor, Molded, 3.3 UH, 5%	0658920006
L29	Inductor, Molded, 0.18 UH, , 10%	0651890004
L30	Inductor, Molded, 0.68 UH, 5%	0659030001
L31	Inductor, Molded, 0.56 UH, 5%	0649530004
L32	Inductor, Molded, 3.3 UH, 5%	0659820006
L33	Inductor, Molded, 4.7 UH, 5%	0651910005

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
L34	Inductor, Molded, 0.22 UH, 5%	0650620003
L35	Inductor, Molded, 4.7 UH, 5%	0651910005
L36	Inductor, Var, 0.18 UH	0647890003
L37	Inductor, Molded, 2.7 UH, 5%	0652180001
L38	Inductor, Molded, 4.7 UH, 5%	0651910005
Q1	Transistor, NPN, Si. 2N4124	0448010003
Q2	Transistor, NPN, Si. 2N4124	0448010003
Q3	Transistor, NPN, Si. 2N4124	0448010003
Q4	Transistor, N-CH, Fet MFE122	0448030004
Q5	Transistor, NPN, Si. 2N5179	0405130008
Q6	Transistor, NPN, Si. 2N5179	0405130008
Q7	Transistor, NPN, Si. 2N5179	0405130008
Q8	Transistor, N-CH, Fet MFE122	0448030004
Q9	Transistor, N-CH, Fet MFE120	0448000008
Q10	Transistor, NPN, Si. 2N5179	0445130008
Q11	Transistor, N-CH, Fet MFE122	0448030004
R1	Resistor, 33 K, 10%, 1/4 W	0177920009
R2	Resistor, 10 K, 10%, 1/4 W	0170410005
R3	Resistor, 1 K, 10%, 1/4 W	0171560001
R4	Resistor, 150, 10%, 1/4 W	0172730007
R5	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R6	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R7	Resistor, 100 K, 10%, 1/4 W	0170390004
R8	Resistor, 150, 10%, 1/4 W	0172730007
R9	Resistor, 120 K, 10%, 1/4 W	0175100004
R10	Resistor, 47 K, 10%, 1/4 W	0171060008
R11	Resistor, 22 K, 5%, 1/4 W	0172230004
R12	Resistor, 220 K, 10%, 1/4 W	0177780002
R13	Resistor, 100, 5%, 1/4 W	0171180003
R14	Resistor, 22 K, 5%, 1/4 W	0172230004
R15	Resistor, 220, 10%, 1/4 W	0171320000
R16	Resistor, 560, 5%, 1/4 W	0183200004
R17	Resistor, 470, 5%, 1/4 W	0184110009
R18	Resistor, 820, 10%, 1/4 W	0178210005
R19	Resistor, 82, 10%, 1/4 W	0184610001
R20	Resistor, 220 K, 10%, 1/4 W	0177780002
R21	Resistor, 56, 10%, 1/4 W	0174290004
R22	Resistor, 22, 10%, 1/4 W	0192690001
R23	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R24	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R25	Resistor, 10 K, 10%, 1/4 W	0170410005
R26	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R27	Resistor, 10 K, 10%, 1/4 W	0170410005
R28	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R29	Resistor, 1.2 K, 10%, 1/4 W	0181860007
R30	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R31	Resistor, 220, 10%, 1/4 W	0171320000
R32	Resistor, 220 K, 10%, 1/4 W	0177780002
R33	Resistor, 22, 10%, 1/4 W	0192690001
R34	Resistor, 150, 10%, 1/4 W	0172730007
R35	Resistor, 12 K, 10%, 1/4 W	0183180003
R36	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R37	Resistor, 1 K, 10%, 1/4 W	0171560001
R38	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R39	Resistor, 220, 10%, 1/4 W	0171320000
R40	Resistor, 10 K, 10%, 1/4 W	0170410005
R41	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R42	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R43	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R44	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R45	Resistor, 22, 10%, 1/4 W	0192690001
R46	Resistor, 220, 10%, 1/4 W	0171320000
R47	Resistor, 220 K, 10%, 1/4 W	0177780002
R48	Resistor, 22 K, 5%, 1/4 W	0172230004
R49	Resistor, 220 K, 10%, 1/4 W	0177780002
R50	Resistor, 47 K, 10%, 1/4 W	0171060008
R51	Resistor, 150, 10%, 1/4 W	0172730007
R52	Resistor, 220, 10%, 1/4 W	0171320000
R53	Resistor, 10 K, 10%, 1/4 W	0170410005
R54	Pot., 500, 20%, 1/2 W, PC Mount	0345980000
R55	Resistor, 10 K, 10%, 1/4 W	0170410005
R56	Resistor, 1 K, 10%, 1/4 W	0171560001
R57	Resistor, 22, 10%, 1/4 W	0192690001
R58	Resistor, 470, 5%, 1/4 W	0184110009
R59	Resistor, 220, 10%, 1/4 W	0171320000

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R60	Resistor, 68, 10%, 1/4 W	0187960003
R61	Resistor, 100, 5%, 1/4 W	0171180003
R62	Resistor, 180, 10%, 1/4 W	0175220000
R63	Resistor, 22, 10%, 1/4 W	0192690001
R64	Resistor, 12 K, 10%, 1/4 W	0183180003
R65	Resistor, 220, 10%, 1/4 W	0171320000
R66	Resistor,, 22, 10%, 1/4 W	0192690001
R67	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R68	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R69	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R70	Resistor, 22 K, 5%, 1/4 W	0172230004
R71	Resistor, 100 K, 10%, 1/4 W	0170390004
R72	Resistor, 22, 10%, 1/4 W	0192690001
R73	Resistor, 22, 10%, 1/4 W	0192690001
R74	Resistor, 100, 5%, 1/4 W	0171180003
R75	Resistor, 100, 5%, 1/4 W	0171180003
R76	Resistor, 100, 5%, 1/4 W	0171180003
T1	Transformer	5024110307
T2	Transformer	5024110307
T3	Transformer	5024111401
U1	IC Linear CA3053	0448060001
U2	IC Linear CA3053	0448060001
U3	IC Linear CA3053	0448060001
Y1	Crystal, 21.0000 MHz, HC-18 U	5024080301
Y2	Crystal, 80.7500 MHz, HC-18 U	5024080408

Translator (1A4A3)





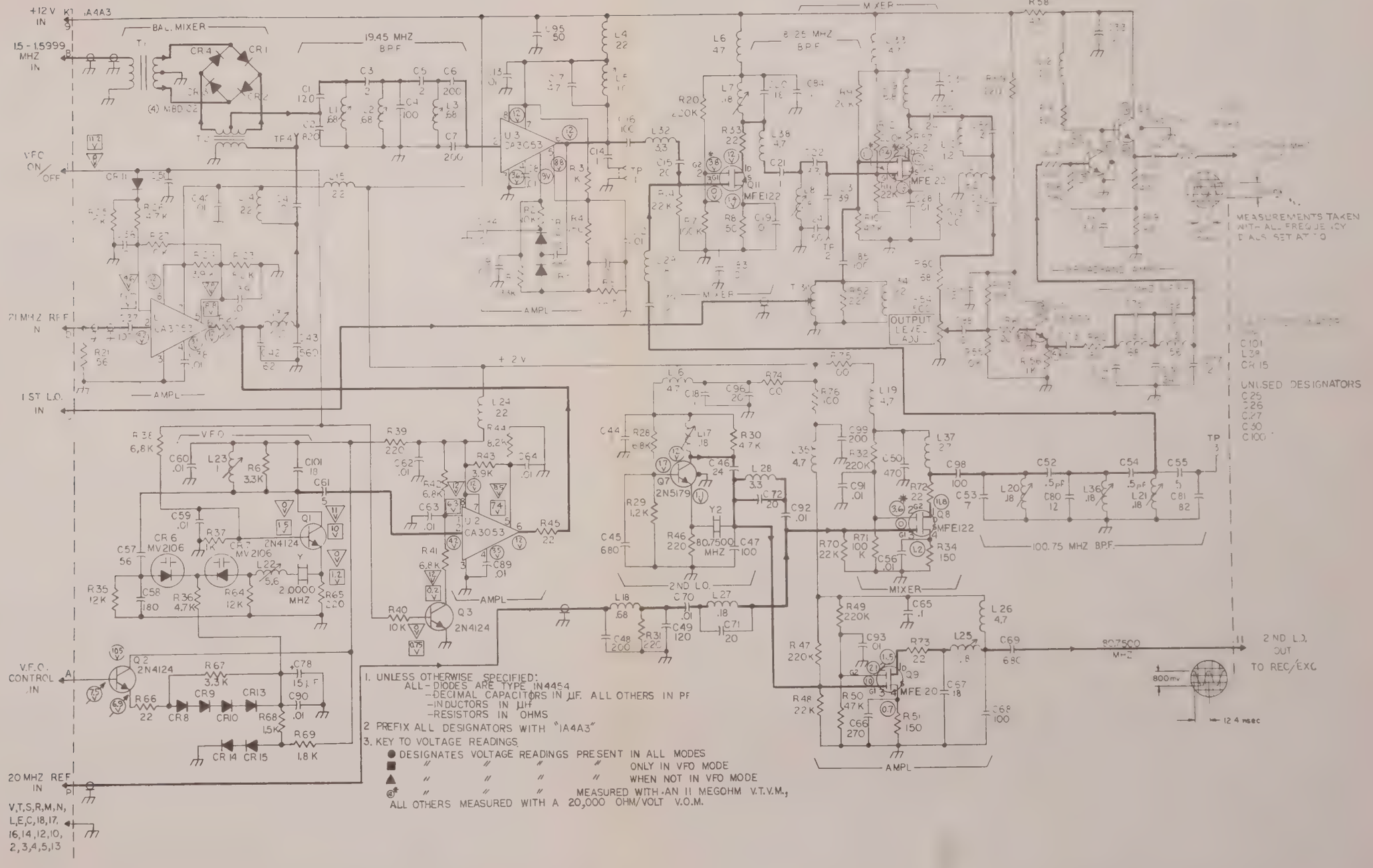
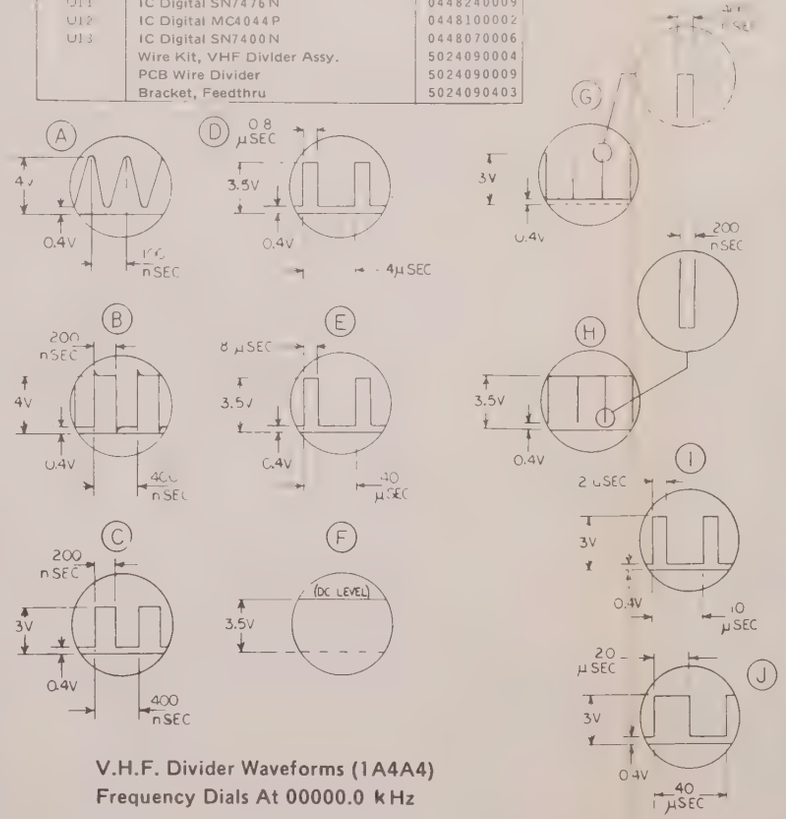

+12 V IN
1.5 - 1.5999 MHZ IN
VFO ON/OFF
21 MHZ REF IN
1ST L.O. IN
20 MHZ REF IN
V,T,S,R,M,N, L,E,C,18,17, 16,14,12,10, 2,3,4,5,13
V.F.O. CONTROL IN
BAL. MIXER
19.45 MHZ B.P.F.
8.25 MHZ B.P.F.
MIXER
AMPL
VFO
2ND L.O.
100.75 MHZ B.P.F.
OUTPUT LEVEL ADJ
+ 2 V
80.7500 MHZ
2ND L.O. OUT TO REC/EXC
800mv
12.4 msec
MEASUREMENTS TAKEN WITH ALL FREQUENCY DIALS SET AT 10
C101 L29 CR15 UNUSED DESIGNATORS C25 C26 C27 C30 C100
1. UNLESS OTHERWISE SPECIFIED:
ALL-DIODES ARE TYPE 1N4454
-DECIMAL CAPACITORS IN µF. ALL OTHERS IN PF
-INDUCTORS IN µH
-RESISTORS IN OHMS
2 PREFIX ALL DESIGNATORS WITH "1A4A3"
3. KEY TO VOLTAGE READINGS
● DESIGNATES VOLTAGE READINGS PRESENT IN ALL MODES
■ " " " " ONLY IN VFO MODE
▲ " " " " WHEN NOT IN VFO MODE
@* " " " MEASURED WITH AN 11 MEGOHM V.T.V.M.,
ALL OTHERS MEASURED WITH A 20,000 OHM/VOLT V.O.M.

Figure 5.14 Translator Schematic (1A4A3)

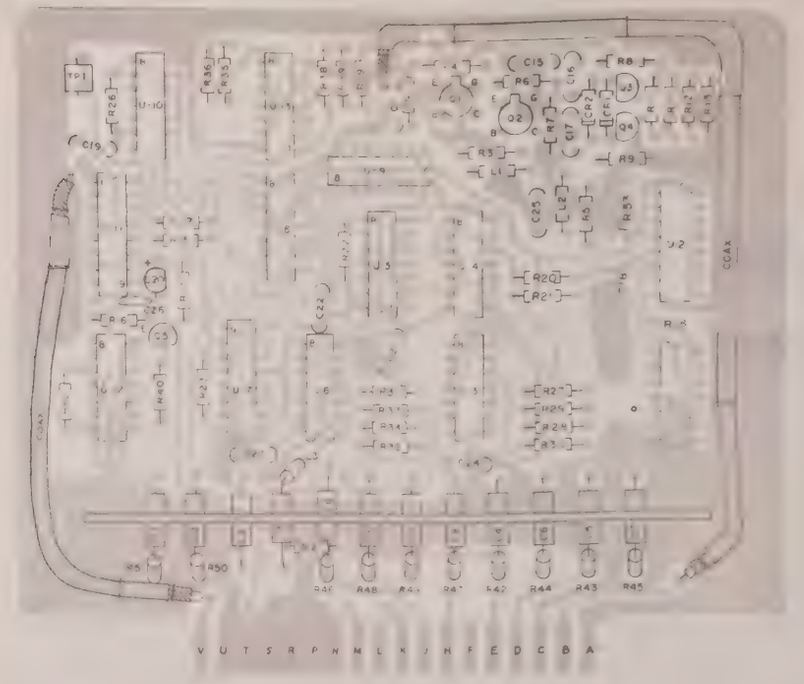
5024100093R PC ASSY VHF VCO

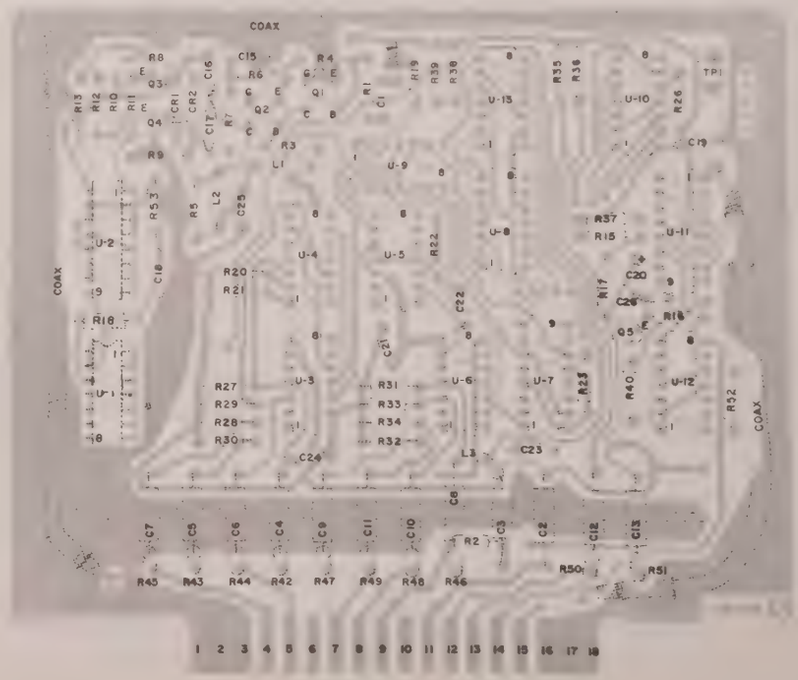
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY VHF DIVIDER	5024090098
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C3	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C4	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C5	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C6	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C7	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C8	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C9	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C10	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C11	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C12	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C13	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C14	Not used	
C15	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007
C16	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C17	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C18	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C19	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C20	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C21	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C22	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C23	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C24	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C25	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002
C26	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003
L1	Inductor, Molded, 22 UH, 5%	0650000005
L2	Inductor, Molded, 22 UH, 5%	0650000005
L3	Inductor, Molded, 15 UH, 5%	0659070006
Q1	Transistor, NPN, Si 2N5179	0445130008
Q2	Transistor, NPN, Si 2N5179	0445130008
Q3	Transistor, NPN, Si 2N4124	0448010003
Q4	Transistor, PNP, Si 2N4126	0448020009
Q5	Transistor, NPN, Si 2N4124	0448010003
R1	Resistor, 56, 10%, 1/4 W	0174290004
R2	Resistor, 100, 5%, 1/4 W	0171180003
R3	Resistor, 820, 10%, 1/4 W	0178210005
R4	Resistor, 470, 10%, 1/4 W	0172610001
R5	Resistor, 1K, 10%, 1/4 W	0171560001
R6	Resistor, 330, 5%, 1/4 W	0170910008
R7	Resistor, 100, 5%, 1/4 W	0171180003
R8	Resistor, 2.7K, 10%, 1/4 W	0186670001
R9	Resistor, 1K, 10%, 1/4 W	0171560001
R10	Resistor, 1K, 10%, 1/4 W	0171560001
R11	Resistor, 22, 10%, 1/4 W	0192690001
R12	Resistor, 22, 10%, 1/4 W	0192690001
R13	Resistor, 1K, 10%, 1/4 W	0171560001
R14	Not used	
R15	Resistor, 1K, 10%, 1/4 W	0171560001
R16	Resistor, 1K, 10%, 1/4 W	0171560001
R17	Resistor, 2.2K, 5%, 1/4 W	0178070009
R18	Resistor, 1K, 10%, 1/4 W	0171560001
R19	Resistor, 1K, 10%, 1/4 W	0171560001
R20	Resistor, 1K, 10%, 1/4 W	0171560001
R21	Resistor, 1K, 10%, 1/4 W	0171560001
R22	Resistor, 1K, 10%, 1/4 W	0171560001
R23	Resistor, 1K, 10%, 1/4 W	0171560001
R24	Not used	
R25	Not used	
R26	Resistor, 1K, 10%, 1/4 W	0171560001
R27	Resistor, 2.2K, 5%, 1/4 W	0178070009
R28	Resistor, 2.2K, 5%, 1/4 W	0178070009
R29	Resistor, 2.2K, 5%, 1/4 W	0178070009
R30	Resistor, 2.2K, 5%, 1/4 W	0178070009
R31	Resistor, 2.2K, 5%, 1/4 W	0178070009
R32	Resistor, 2.2K, 5%, 1/4 W	0178070009
R33	Resistor, 2.2K, 5%, 1/4 W	0178070009
R34	Resistor, 2.2K, 5%, 1/4 W	0178070009
R35	Resistor, 2.2K, 5%, 1/4 W	0178070009
R36	Resistor, 2.2K, 5%, 1/4 W	0178070009
R37	Resistor, 1K, 10%, 1/4 W	0171560001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R38	Resistor, 2.2K, 5%, 1/4 W	0178070009
R39	Resistor, 2.2K, 5%, 1/4 W	0178070009
R40	Resistor, 1K, 10%, 1/4 W	0171560001
R41	Not used	
R42	Resistor, 68, 10%, 1/4 W	0187960003
R43	Resistor, 68, 10%, 1/4 W	0187960003
R44	Resistor, 68, 10%, 1/4 W	0187960003
R45	Resistor, 68, 10%, 1/4 W	0187960003
R46	Resistor, 68, 10%, 1/4 W	0187960003
R47	Resistor, 68, 10%, 1/4 W	0187960003
R48	Resistor, 68, 10%, 1/4 W	0187960003
R49	Resistor, 68, 10%, 1/4 W	0187960003
R50	Resistor, 68, 10%, 1/4 W	0187960003
R51	Resistor, 68, 10%, 1/4 W	0187960003
R52	Resistor, 22 M, 10%, 1/4 W	0180950002
R53	Resistor, 1K, 10%, 1/4 W	0171560001
TP1	Test Point, White	0753640007
U1	IC Digital SN7400 N	0448070006
U2	IC Digital SN74S112 N	0448450003
U3	IC Digital 74LS196 N Selected	0448250004
U4	IC Digital SN7401 N	0448230003
U5	IC Digital SN7400 N	0448070006
U6	IC Digital 74LS196 N Selected	0448250004
U7	IC Digital SN7476 N	0448240009
U8	IC Digital SN7400 N	0448070006
U9	IC Digital SN7430 N	0448110008
U10	IC Digital SN74H72 N	0448090007
U11	IC Digital SN7476 N	0448240009
U12	IC Digital MC4044 P	0448100002
U13	IC Digital SN7400 N	0448070006
	Wire Kit, VHF Divider Assy.	5024090004
	PCB Wire Divider	5024090009
	Bracket, Feedthru	5024090403



V.H.F. Divider Waveforms (1A4A4)
Frequency Dials At 00000.0 kHz





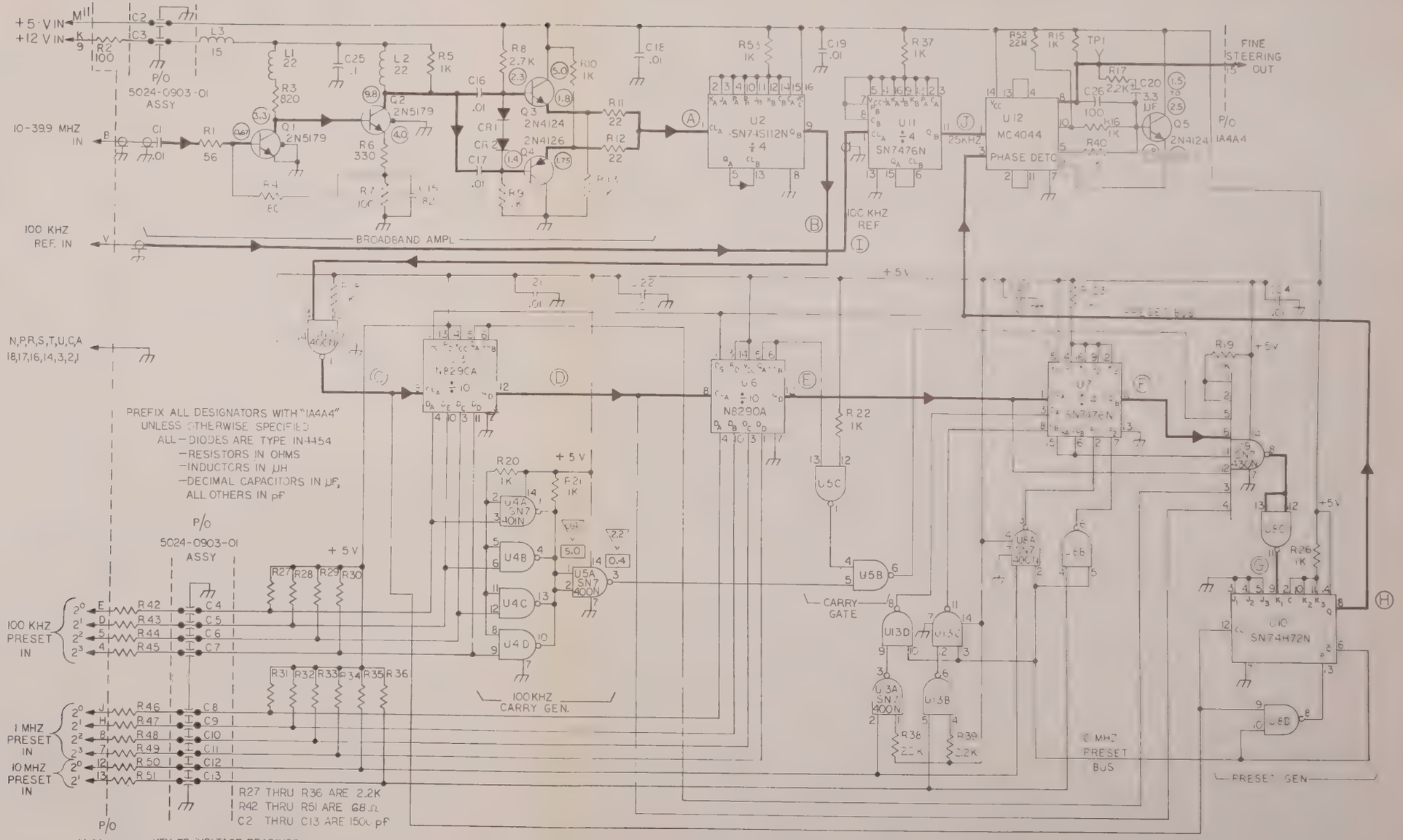
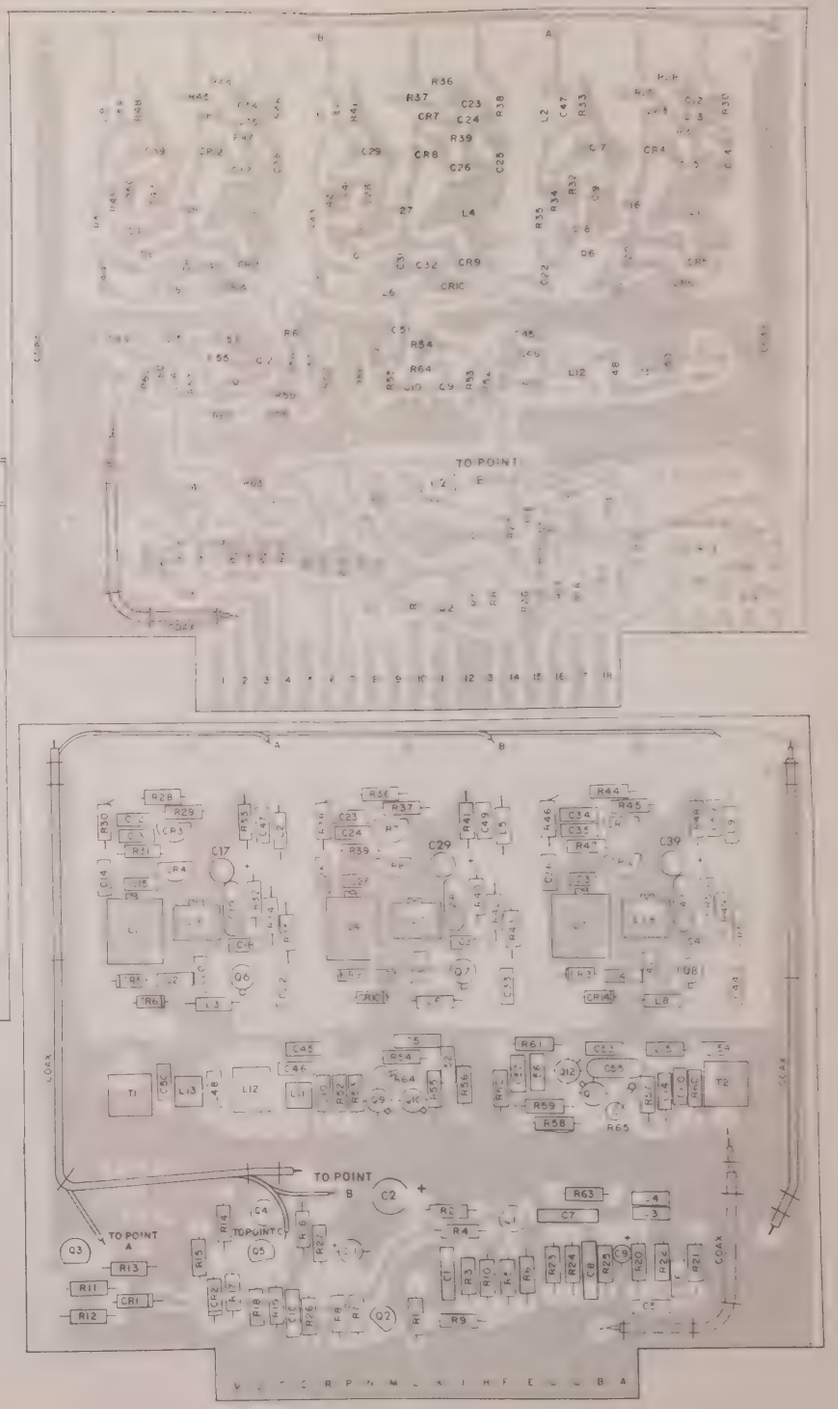

5024090071D
+5 V IN
+12 V IN
10-39.9 MHZ IN
100 KHZ REF. IN
BROADBAND AMPL
100 KHZ REF
FINE STEERING OUT
P/O 1A4A4
P/O 5024-0903-01 ASSY
25KHZ
PHASE DETC
N,P,R,S,T,U,C,A
18,17,16,14,3,2,1
PREFIX ALL DESIGNATORS WITH "1A4A4" UNLESS OTHERWISE SPECIFIED
ALL — DIODES ARE TYPE IN4454
— RESISTORS IN OHMS
— INDUCTORS IN µH
— DECIMAL CAPACITORS IN µF, ALL OTHERS IN pf
100 KHZ PRESET IN
1 MHZ PRESET IN
10 MHZ PRESET IN
100KHZ CARRY GEN.
CARRY GATE
10 MHZ PRESET BUS
PRESET GEN
R27 THRU R36 ARE 2.2K
R42 THRU R51 ARE 68Ω
C2 THRU C13 ARE 150pf
KEY TO VOLTAGE READINGS
(12) DESIGNATES — VOLTAGE PRESENT IN ALL MODES
(B) — REFERENCE WAVEFORM WITH ALL FREQUENCY DIALS SET AT "0"
[5] — VOLTAGE PRESENT WITH ALL 100 KHZ PRESET INPUTS IN "0" STATE (100 KHZ DIAL=0)
5 — VOLTAGE PRESENT IF ANY 100 KHZ PRESET INPUT IS IN A "1" STATE (100 KHZ DIAL≠0)
ALL D.C. VOLTAGES MEASURED WITH 20,000 OHM/VOLT V.O.M. AND MAY VARY ±15%
ALL WAVEFORMS MEASURED WITH 100MHZ OSCILLOSCOPE AND 9pf/1 MEGOHM PROBE

Figure 5.15 V.H.F. Divider Schematic (1A4A4)

5024100093R PC ASSY VHF VCO

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY VHR VCO	5024100093
C1	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C2	Capacitor, 47 UF, 20 V, 196 D	0281700001
C3	Capacitor, 470 PF, 100 V, CD7, 5%	0285570005
C4	Capacitor, 470 PF, 100 V, CD7, 5%	0285570005
C5	Capacitor, 470 PF, 100 V, CD7, 5%	0285570005
C6	Capacitor, 470 PF, 100 V, CD7, 5%	0285570005
C7	Capacitor, 0.01 UF, 50 V, Mylar	0281560005
C8	Capacitor, .033 UF, 50 V, Mylar	0281770000
C9	Capacitor, .33 UF, 35 V, 196 D	0281650004
C10	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C11	Capacitor, 22 UF, 15 V, 196 D	0281690006
C12	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C13	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C14	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C15	Capacitor, 150 PF, 300 V, CD7, 5%	0280900007
C16	Capacitor, 2-8 PF, 200 V, NPO	0284300004
C17	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C18	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C19	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C20	Capacitor, 7 PF, 500 V, DM10	0292400004
C21	Capacitor, 5 PF, 500 V, DM10	0261190008
C22	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C23	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C24	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C25	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C26	Capacitor, 150 PF, 300 V, CD7, 5%	0280900007
C27	Capacitor, 3-15 PF, 200 V, N650	0285710001
C28	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C29	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C30	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C31	Capacitor, 7 PF, 500 V, DM10	0292400004
C32	Capacitor, 18 PF, 500 V, DM10, 5%	0260300004
C33	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C34	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C35	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C36	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C37	Capacitor, 150 PF, 300 V, CD7, 5%	0280900007
C38	Capacitor, 3-15 PF, 200 V, N650	0285710001
C39	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C40	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C41	Capacitor, 7 PF, 500 V, DM10	0292400004
C42	Capacitor, 18 PF, 500 V, DM10, 5%	0260300004
C43	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C44	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C45	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C46	Capacitor, 18 PF, 500 V, DM10, 5%	0260300004
C47	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C48	Capacitor, 3.3 PF, 1000 V, NPO	0262240009
C49	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C50	Capacitor, 6 PF, 1000 V, NDO	0250360004
C51	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C52	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C53	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C54	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C55	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C56	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C57	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C58	Not used	
C59	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C60	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
CR1	Diode, Signal, Sil. 1 N4454	0405270003
CR2	Diode, Signal, Sil. 1 N4454	0405270003
CR3	Diode, Varicap MV2104	0405330006
CR4	Diode, Varicap MV2104	0405330006
CR5	Diode, Hot Carrier	0405280009
CR6	Diode, Hot Carrier	0405280009
CR7	Diode, Varicap MV 2104	0405330006
CR8	Diode, Varicap MV 2104	0405330006
CR9	Diode, Hot Carrier	0405280009
CR10	Diode, Hot Carrier	0405280009
CR11	Diode, Varicap MV2103	0405320001
CR12	Diode, Varicap MV2103	0405320001
CR13	Diode, Hot Carrier	0405280009
CR14	Diode, Hot Carrier	0405280009
J1	Connector, RF, Subminiature	0753670003
L1	Inductor, Var, VDC	5024100701
L2	Inductor, Molded, 2.2 UH, 10%	0659710005
L3	Inductor, Molded, 10 UH, 5%	0659570009
L4	Inductor, Var, VCO	5024100008
L5	Inductor, Molded, 2.2 UH, 10%	0659710005
L6	Inductor, Molded, 10 UH, 5%	0659570009
L7	Inductor, Var, VCO	5024100905
L8	Inductor, Molded, 10 UH, 5%	0659570009
L9	Inductor, Molded, 2.2 UH, 10%	0659710005
L10	Inductor, Molded, 2.2 UH, 10%	0659710005
L11	Inductor, Air Wound, VCO .125 D	5024101201
L12	Inductor, Var, VCO	5024100603
L13	Inductor, Air Wound, VCO .250 D	5024101308
L14	Inductor, Molded, 2.2 UH, 10%	0659710005
L15	Inductor, Molded, 0.27 UH, 5%	0649390008
Q1	Transistor, PNP, Si. 2 N4126	0448020009
Q2	Transistor, PNP, Si. 2 N4126	0448020009
Q3	Transistor, PNP, Si. 2 N4126	0448020009
Q4	Transistor, PNP, Si. 2 N4126	0448020009
Q5	Transistor, PNP, Si. 2 N4126	0448020009
Q6	Transistor, N-CH, FET MFE120	0448000008
Q7	Transistor, N-CH, FET MFE120	0448000008
Q8	Transistor, N-CH, FET MFE120	0448000008
Q9	Transistor, NPN, Si. 2 N5179	0445130008
Q10	Transistor, NPN, Si. 2 N5179	0445130008
Q11	Transistor, NPN, Si. 2 N5179	0445130008
Q12	Transistor, NPN, Si. 2 N5179	0445130008
R1	Resistor, 27, 10%, 1/4 W	0172590001
R2	Resistor, 100, 5%, 1/4 W	0171180003
R3	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R4	Resistor, 5.6 K, 10%, 1/4 W	0180360008
R5	Resistor, 560, 5%, 1/4 W	0183200004
R6	Resistor, 180, 10%, 1/4 W	0175220000
R7	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R8	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R9	Resistor, 560, 5%, 1/4 W	0183200008
R10	Resistor, 180, 10%, 1/4 W	0175220000
R11	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R12	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R13	Resistor, 4.7 K, 1/4 W	0170770001
R14	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R15	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R16	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R17	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R18	Resistor, 4.7 K, 5%, 1/4 W	0170700001
R19	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R20	Resistor, 13.7 K, 1%, 1/8 W	0196230004
R21	Resistor, 13.7 K, 1%, 1/8 W	0196230004
R22	Resistor, 6.81 K, 1%, 1/8 W	0196350000
R23	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R24	Resistor, 1 K, 10%, 1/4 W	0171560001
R25	Resistor, 475, 1%, 1/8 W	0196610001
R26	Resistor, 10 K, 10%, 1/4 W	0170410005
R27	Resistor, 2670, 1%, 1/8 W	0196730007
R28	Resistor, 27, 10%, 1/4 W	0172590001
R29	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R30	Resistor, 27, 10%, 1/4 W	0172590001
R31	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R32	Resistor, 100 K, 10%, 1/4 W	0170390004
R33	Resistor, 47 K, 10%, 1/4 W	0171060008
R34	Resistor, 1 K, 10%, 1/4 W	0171560001
R35	Resistor, 220, 10%, 1/4 W	0171320000
R36	Resistor, 27, 10%, 1/4 W	0172590001
R37	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R38	Resistor, 27, 10%, 1/4 W	0172590001
R39	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R40	Resistor, 100 K, 10%, 1/4 W	0170390004
R41	Resistor, 47 K, 10%, 1/4 W	0171060008
R42	Resistor, 1 K, 10%, 1/4 W	0171560001
R43	Resistor, 220, 10%, 1/4 W	0171320000
R44	Resistor, 27, 10%, 1/4 W	0172590001
R45	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R46	Resistor, 27, 10%, 1/4 W	0172590001
R47	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R48	Resistor, 47 K, 10%, 1/4 W	0171060008
R49	Resistor, 1 K, 10%, 1/4 W	0171560001
R50	Resistor, 100 K, 10%, 1/4 W	0170390004
R51	Resistor, 220, 10%, 1/4 W	0171320000
R52	Resistor, 10, 5%, 1/4 W	0177160004
R53	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R54	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R55	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R56	Resistor, 220, 10%, 1/4 W	0171320000
R57	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R58	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R59	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R60	Resistor, 27, 10%, 1/4 W	0172590001
R61	Resistor, 10, 5%, 1/4 W	0177160004
R62	Resistor, 220, 10%, 1/4 W	0171320000
R63	Resistor, 22, 10%, 1/4 W	0192690001
R64	Resistor, 100, 5%, 1/4 W	0171180003
R65	Resistor, 100, 5%, 1/4 W	0171180003
T1	Transformer	5024111401
	Washer, Split No. 4	0500020001
	Washer, Flat No. 4 .281 OD	0500180008
	Screw, PH 4-40 x 7/8 Lg.	0500850143
	Washer, Flat .120 ID .190 OD	0517860007
	Wire, Buss No. 22 DNP	0589040006



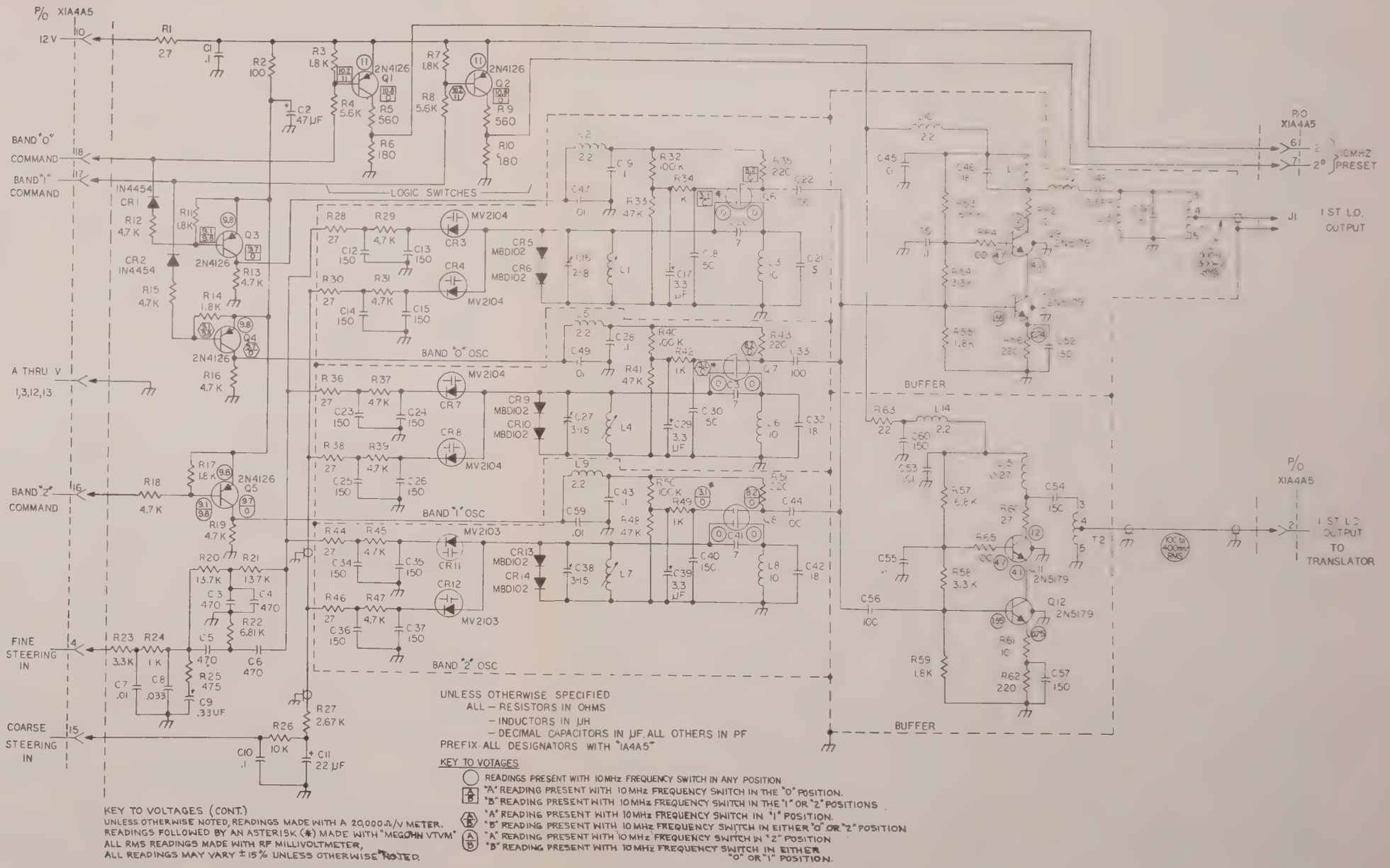
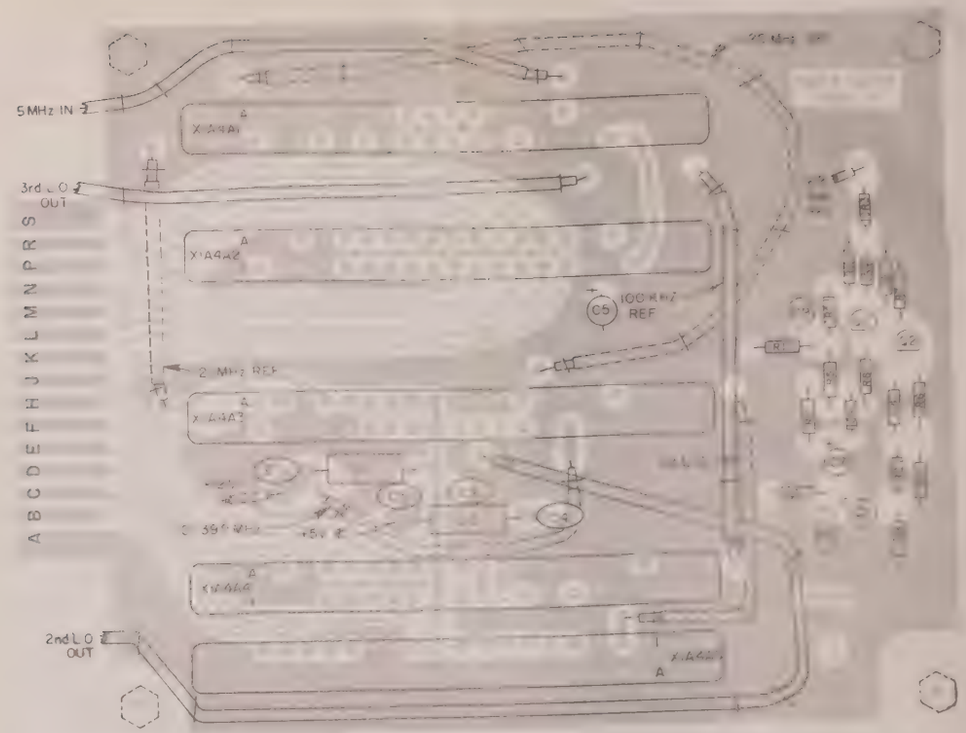

P/O XIA4A5
12 V
BAND "0" COMMAND
BAND "1" COMMAND
BAND "2" COMMAND
A THRU V
1,3,12,13
FINE STEERING IN
COARSE STEERING IN
LOGIC SWITCHES
BAND "0" OSC
BAND "1" OSC
BAND "2" OSC
BUFFER
BUFFER
P/O XIA4A5
10MHZ PRESET
1 ST LO. OUTPUT
P/O XIA4A5
1 ST LO OUTPUT TO TRANSLATOR
UNLESS OTHERWISE SPECIFIED
ALL — RESISTORS IN OHMS
— INDUCTORS IN µH
— DECIMAL CAPACITORS IN µF, ALL OTHERS IN PF
PREFIX: ALL DESIGNATORS WITH "1A4A5"
KEY TO VOTAGES
READINGS PRESENT WITH 10MHz FREQUENCY SWITCH IN ANY POSITION
"A" READING PRESENT WITH 10 MHz FREQUENCY SWITCH IN THE "0" POSITION.
"B" READING PRESENT WITH 10MHz FREQUENCY SWITCH IN THE "1" OR "2" POSITIONS
"A" READING PRESENT WITH 10MHz FREQUENCY SWITCH IN "1" POSITION.
"B" READING PRESENT WITH 10 MHz FREQUENCY SWITCH IN EITHER "0" OR "2" POSITION
"A" READING PRESENT WITH 10 MHz FREQUENCY SWITCH IN "2" POSITION
"B" READING PRESENT WITH 10MHz FREQUENCY SWITCH IN EITHER "0" OR "1" POSITION.
KEY TO VOLTAGES (CONT.)
UNLESS OTHERWISE NOTED, READINGS MADE WITH A 20,000Ω/V METER.
READINGS FOLLOWED BY AN ASTERISK (*) MADE WITH "MEGOHN VTVM"
ALL RMS READINGS MADE WITH RF MILLIVOLTMETER,
ALL READINGS MAY VARY ± 15% UNLESS OTHERWISE NOTED.

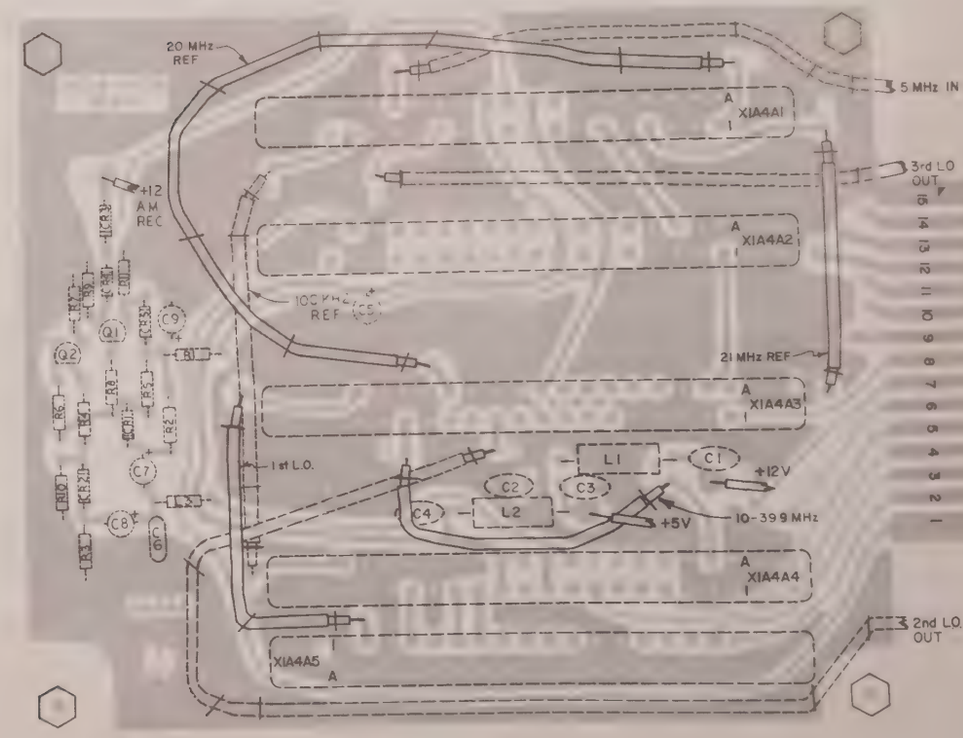
Figure 5.16 VCO Schematic (1A4A5)

5024011597B PC ASSY MOTHER BD. SYNTH.

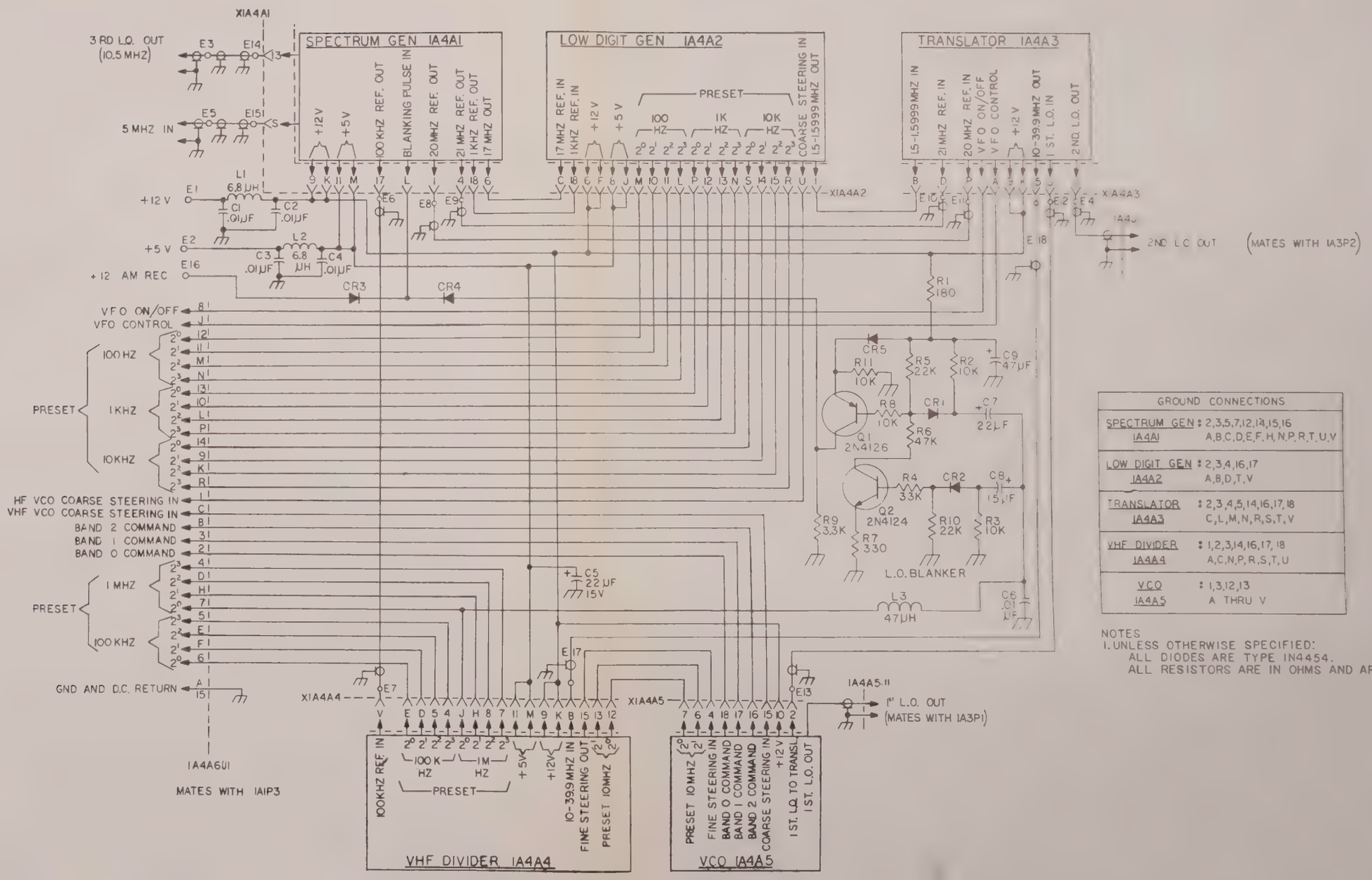
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY MOTHER BD. SYNTH.	5024011597
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C3	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C4	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C5	Capacitor, 22 UF, 15 V, 196D	0281690006
C6	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C7	Capacitor, 22 UF, 15 V, 196D	0281690006
C8	Capacitor, 15 UF, 15 V, 196D	0281720002
C9	Capacitor, 47 UF, 20 V, 196D	0281700001
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003
CR3	Diode, Signal, Sil. 1N4454	0405270003
CR4	Diode, Signal, Sil. 1N4454	0405270003
CR5	Diode, Signal, Sil. 1N4454	0405270003
J1	Connector, RF, Subminiature	0753630001
L1	Inductor, Molded, 6.8 UH, 10%	0652200001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
L2	Inductor, Molded, 6.8 UH, 10%	0652200001
L3	Inductor, Molded, 47 UH, 5%	0652680003
Q1	Transistor, PNP, SI 2N4126	0448020009
Q2	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 180, 10%, 1/4 W	0175220000
R2	Resistor, 10K, 10%, 1/4 W	0170410005
R3	Resistor, 10K, 10%, 1/4 W	0170410005
R4	Resistor, 33K, 10%, 1/4 W	0177920009
R5	Resistor, 22K, 5%, 1/4 W	0172230004
R6	Resistor, 47K, 10%, 1/4 W	0171060008
R7	Resistor, 330, 5%, 1/4 W	0170910008
R8	Resistor, 10K, 10%, 1/4 W	0170410005
R9	Resistor, 3.3K, 10%, 1/4 W	0170890007
R10	Resistor, 22K, 5%, 1/4 W	0172230004
R11	Resistor, 10K, 10%, 1/4 W	0170410005
	Connector, PC, 18 Pin Female	0753610001
	Connector, RF, Subminiature	0753630001
	Key, Polarized, Connector	0753620006





5024011554C



GROUND CONNECTIONS	
SPECTRUM GEN 1A4A1	: 2,3,5,7,12,14,15,16 A,B,C,D,E,F,H,N,P,R,T,U,V
LOW DIGIT GEN 1A4A2	: 2,3,4,16,17 A,B,D,T,V
TRANSLATOR 1A4A3	: 2,3,4,5,14,16,17,18 C,L,M,N,R,S,T,V
VHF DIVIDER 1A4A4	: 1,2,3,14,16,17,18 A,C,N,P,R,S,T,U
VCO 1A4A5	: 1,3,12,13 A THRU V

NOTES
1. UNLESS OTHERWISE SPECIFIED:
ALL DIODES ARE TYPE IN4454.
ALL RESISTORS ARE IN OHMS AND ARE ¼W.

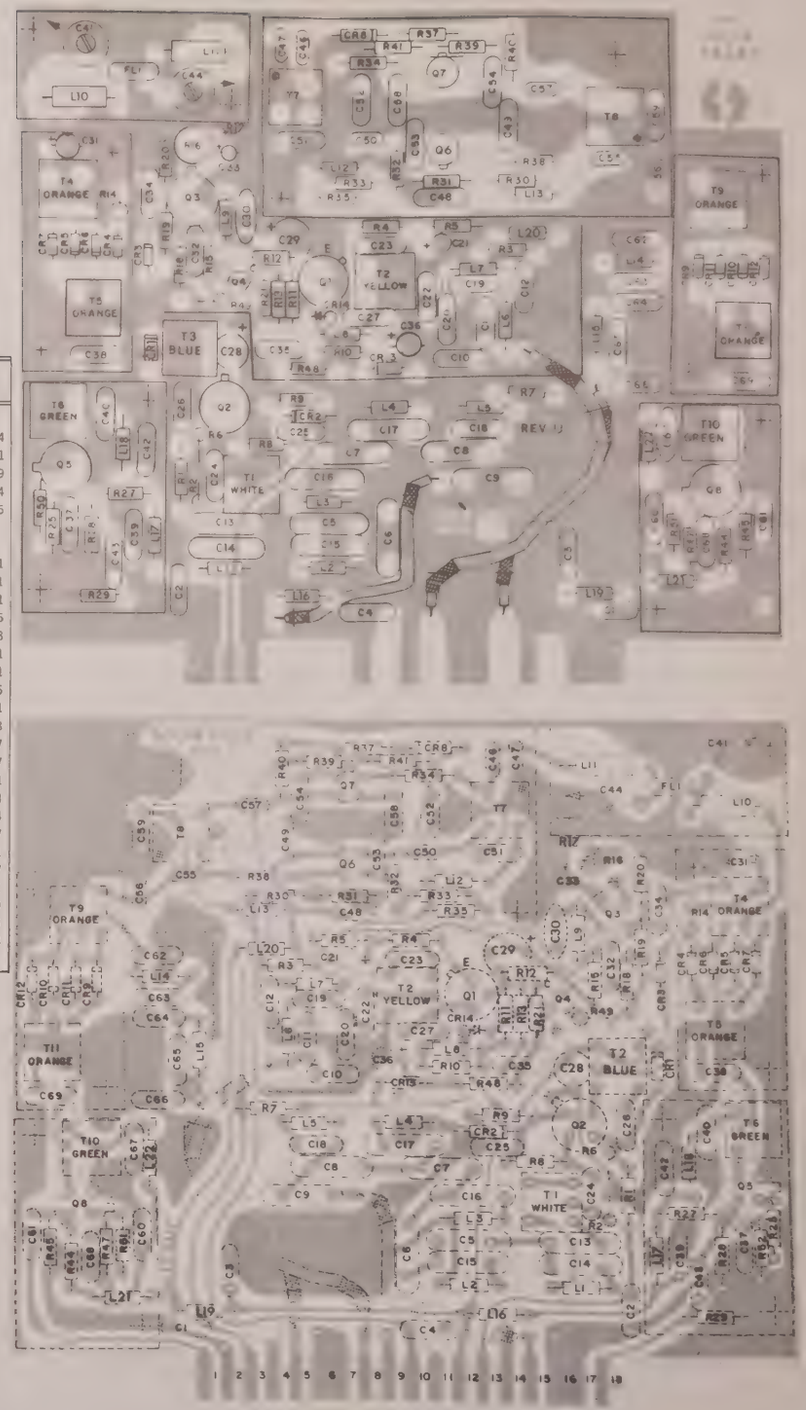
Figure 5.17 Syntheszier Mother Board Schematic (1A4A6)

5024110099L PC ASSY VHF MIXER

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY VHR MIXER	5024110099
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 0.001 UF, 100 V, X5E, 10%	0282080007
C3	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C4	Capacitor, 0.001 UF, 100 V, X5E, 10%	0282080007
C5	Capacitor, 2000 PF, 500 V, DM19, 2%	0281410003
C6	Capacitor, 3300 PF, 500 V, DM19, 2%	0281250006
C7	Capacitor, 2700 PF, 500 V, DM19, 2%	0281240001
C8	Capacitor, 1500 PF, 500 V, DM19, 2%	0281270007
C9	Capacitor, 1800 PF, 500 V, DM19, 2%	0281300003
C10	Capacitor, 75 PF, 500 V, DM15, 2%	0281110000
C11	Capacitor, 56 PF, 500 V, DM15, 5%	0274620006
C12	Capacitor, 150 PF, 500 V, DM15, 5%	0274980002
C13	Capacitor, 2400 PF, 500 V, DM19, 2%	0280980001
C14	Capacitor, 3300 PF, 500 V, DM19, 2%	0281250006
C15	Capacitor, 1200 PF, 500 V, DM19, 2%	0281030006
C16	Capacitor, 910 PF, 500 V, DM19, 2%	0281450005
C17	Capacitor, 2000 PF, 500 V, DM19, 2%	0281410003
C18	Capacitor, .012 UF, 50 V, Mylar	0281780005
C19	Capacitor, 20 PF, 500 V, DM10, 5%	0260420000
C20	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C21	Capacitor, 1 UF, 50 V, 198 D	0280910002
C22	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C23	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C24	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C25	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C26	Capacitor, 0.001 UF, 100 V, X5E, 10%	0282080007
C27	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C28	Capacitor, 47 UF, 20 V, 196 D	0281700001
C29	Capacitor, 47 UF, 20 V, 196 D	0281700001
C30	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C31	Capacitor, 0.33 UF, 35 V, 196 D	0281650004
C32	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C33	Capacitor, 1 UF, 35 V, 196 D	0281660000
C34	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C35	Capacitor, 0.001 UF, 100 V, X7 R, 20%	0281630003
C36	Capacitor, 1 UF, 50 V, 198 D	0280910002
C37	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C38	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C39	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C40	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C41	Capacitor, 2-8 PF, 350 V, NPO	0268220000
C42	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C43	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C44	Capacitor, 2-8 PF, 350 V, NPO	0268220000
C45	Not used	
C46	Capacitor, 10 PF, 500 V, DM10	0259830003
C47	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007
C48	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C49	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C50	Capacitor, 33 PF, 500 V, DM10, 5%	0260780006
C51	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C52	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C53	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C54	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610008
C55	Capacitor, 10 PF, 500 V, DM10	0259830003
C56	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007
C57	Capacitor, 33 PF, 500 V, DM10, 5%	0260780006
C58	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C59	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C60	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C61	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C62	Capacitor, 250 PF, 500 V, DM15, 2%	0281100004
C63	Capacitor, 43 PF, 500 V, DM10, 5%	0260800007
C64	Capacitor, 430 PF, 500 V, DM15, 5%	0289590001
C65	Capacitor, 130 PF, 500 V, DM15, 2%	0281010005
C66	Capacitor, 200 PF, 500 V, DM15, 5%	0258040009
C67	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C68	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C69	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
CR1	Diode, Signal, Sil. 1 N4454	0405270003
CR2	Diode, Zener 1 N5227 B	0405250002
CR3	Diode, Signal, Sil. 1 N4454	0405270003
CR4	Diode, Hot Carrier	0405280009
-	Diode, Hot Carrier	0405280009

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
CR6	Diode, Hot Carrier	0405280009
CR7	Diode, Hot Carrier	0405280009
CR8	Diode, Zener 1 N5227 B	0405250002
CR9	Diode, Hot Carrier	0405280009
CR10	Diode, Hot Carrier	0405280009
CR11	Diode, Hot Carrier	0405280009
CR12	Diode, Hot Carrier	0405280009
CR13	Diode, Signal, Sil. 1 N4454	0405270003
CR14	Diode, Signal, Sil. 1 N4454	0405270003
FL1	Filter, Crystal, 91, 25 MHz	5024110501
L1	Inductor, Molded, 6.8 UH, 5%	0659210002
L2	Inductor, Molded, 12 UH, 5%	0652700004
L3	Inductor, Molded, 15 UH, 5%	0659070006
L4	Inductor, Molded, 8.2 UH, 5%	0652060005
L5	Inductor, Molded, 4.7 UH, 5%	0651910005
L6	Inductor, Molded, 0.22 UH, 5%	0650620003
L7	Inductor, Molded, 0.27 UH, 5%	0649390008
L8	Inductor, Molded, 4.7 UH, 5%	0651910005
L9	Inductor, Molded, 1.8 UH, 5%	0652440002
L10	Inductor, Molded, 0.68 UH, 5%	0651770009
L11	Inductor, Molded, 0.68 UH, 5%	0651770009
L12	Inductor, Molded, 2.2 UH, 5%	0649890001
L13	Inductor, Molded, 2.2 UH, 5%	0649890001
L14	Inductor, Molded, 0.82 UH, 5%	0652320007
L15	Inductor, Molded, 0.56 UH, 5%	0649530004
L16	Inductor, Molded, 3.9 UH, 5%	0650480007
L17	Inductor, Molded, 3.9 UH, 5%	0650480007
L18	Inductor, Molded, 3.9 UH, 5%	0650480007
L19	Inductor, Molded, 3.9 UH, 5%	0650480007
L20	Inductor, Molded, 3.9 UH, 5%	0605480007
L21	Inductor, Molded, 3.9 UH, 5%	0605480007
L22	Inductor, Molded, 3.9 UH, 5%	0605480007
Q1	Transistor, NPN, Si, 2 N3866	0448140004
Q2	Transistor, N-CH, FET 40673	0447450000
Q3	Transistor, NPN, Si. 2 N5179	0445130008
Q4	Transistor, NPN, Si. 2 N4124	0448010003
Q5	Transistor, NPN, Si. 2 N5179	0445130008
Q6	Transistor, N-CH, FET 40673	0447450000
Q7	Transistor, N-CH, FET 40673	0447450000
Q8	Transistor, NPN, Si. 2 N5179	0445130008
R1	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R2	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R3	Resistor, 27, 10%, 1/4 W	0172590001
R4	Resistor, 10, 5%, 1/4 W	0177160004
R5	Resistor, 120, 10%, 1/4 W	0186550006
R6	Resistor, 10 K, 10%, 1/4 W	0170410005
R7	Resistor, 47, 10%, 1/4 W	0179360001
R8	Resistor, 100 K, 10%, 1/4 W	0170390004
R9	Resistor, 820, 10%, 1/4 W	0178210005
R10	Resistor, 820, 10%, 1/4 W	0178210005
R11	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R12	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R13	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R14	Resistor, 560, 5%, 1/4 W	0183200004
R15	Resistor, 220, 10%, 1/4 W	0171320000
R16	Pot., 500, 20%, 1/2 W, PC Mount	0345980000
R17	Resistor, 560, 5%, 1/4 W	0183200004
R18	Resistor, 1.2 K, 10%, 1/4 W	0181860007
R19	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R20	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R21	Resistor, 1 K, 10%, 1/4 W	0171560001
R22	Not used	
R23	Not Used	
R24	Not used	
R25	Resistor, 470, 10%, 1/4 W	0172610001
R26	Not used	
R27	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R28	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R29	Resistor, 56, 10%, 1/4 W	0174290004
R30	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R31	Resistor, 10 K, 10%, 1/4 W	0170410005
R32	Resistor, 100 K, 10%, 1/4 W	0170390004
R33	Resistor, 10, 5%, 1/4 W	0177160004
R34	Resistor, 27, 10%, 1/4 W	0172590001
R35	Resistor, 820, 10%, 1/4 W	0178210005

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R36	Not used	
R37	Resistor, 10, 5%, 1/4 W	0177160004
R38	Resistor, 27, 10%, 1/4 W	0172590001
R39	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R40	Resistor, 100 K, 10%, 1/4 W	0170390004
R41	Resistor, 10 K, 10%, 1/4 W	0170410005
R42	Not used	
R43	Not used	
R44	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R45	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R47	Resistor, 470, 10%, 1/4 W	0172610001
R48	Resistor, 10 K, 10%, 1/4 W	0170410005
R49	Resistor, 68, 10%, 1/4 W	0187960003
R50	Resistor, 22, 10%, 1/4 W	0192690001
R51	Resistor, 22, 10%, 1/4 W	0192690001
T1	Transformer, Input	5024110706
T2	Transformer	5024111401
T3	Transformer, RF Amp	5024110803
T4	Transformer	5024110307
T5	Transformer	5024110307
T6	Transformer	5024110901
T7	Inductor	5024110404
T8	Inductor	5024110404
T9	Transformer	5024110307
T10	Transformer	5024110901
T11	Transformer	5024110307
	Shield Can	5024111001
	Shield Can	5024111109
	Shield Can	5024111206
	Shield Can	5024111303



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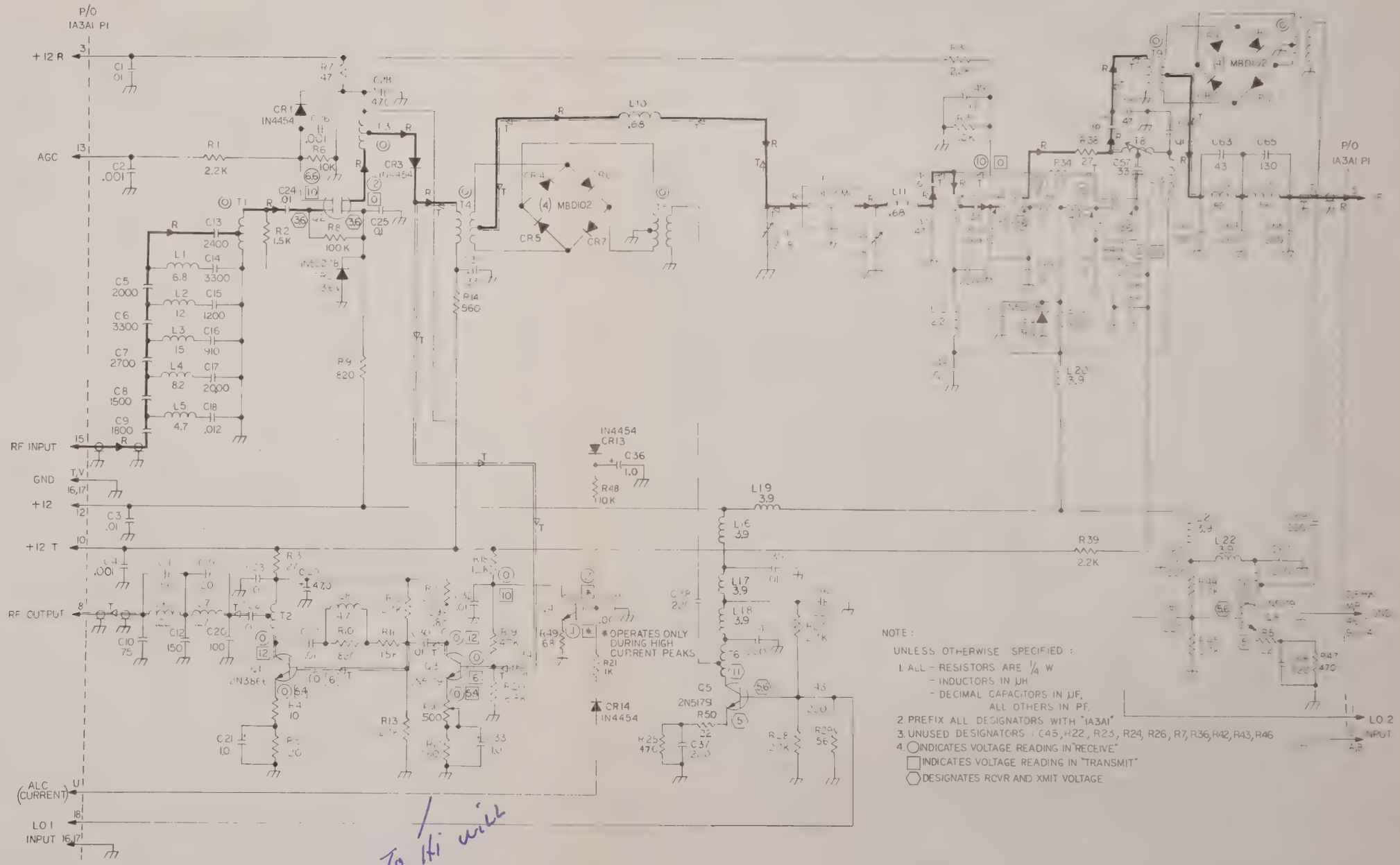


To Hi with cable OSC

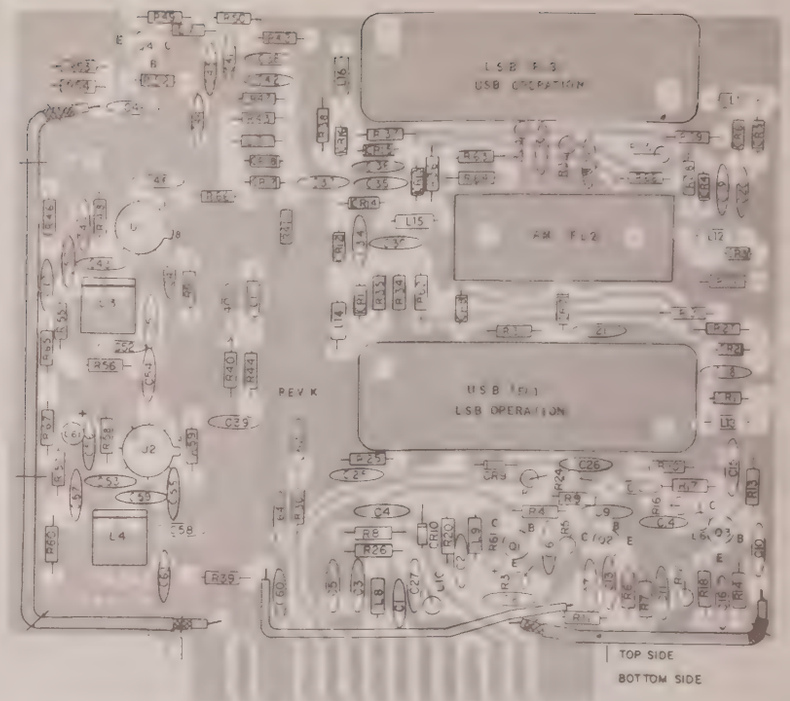
Figure 5.18 VHF Mixer Schematic (1A3A1)

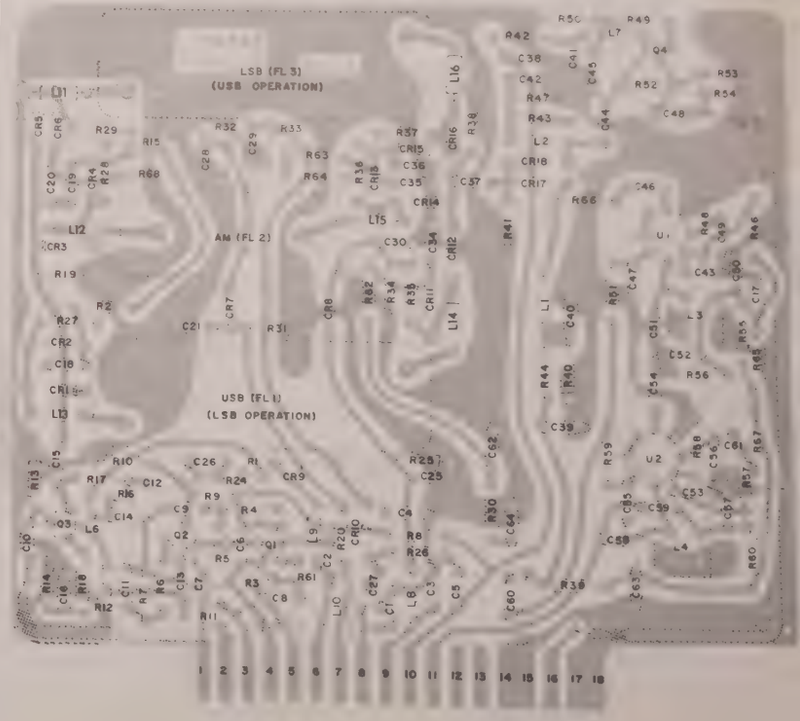
5024120191H PC ASSY IF FILTER W/O FILTERS

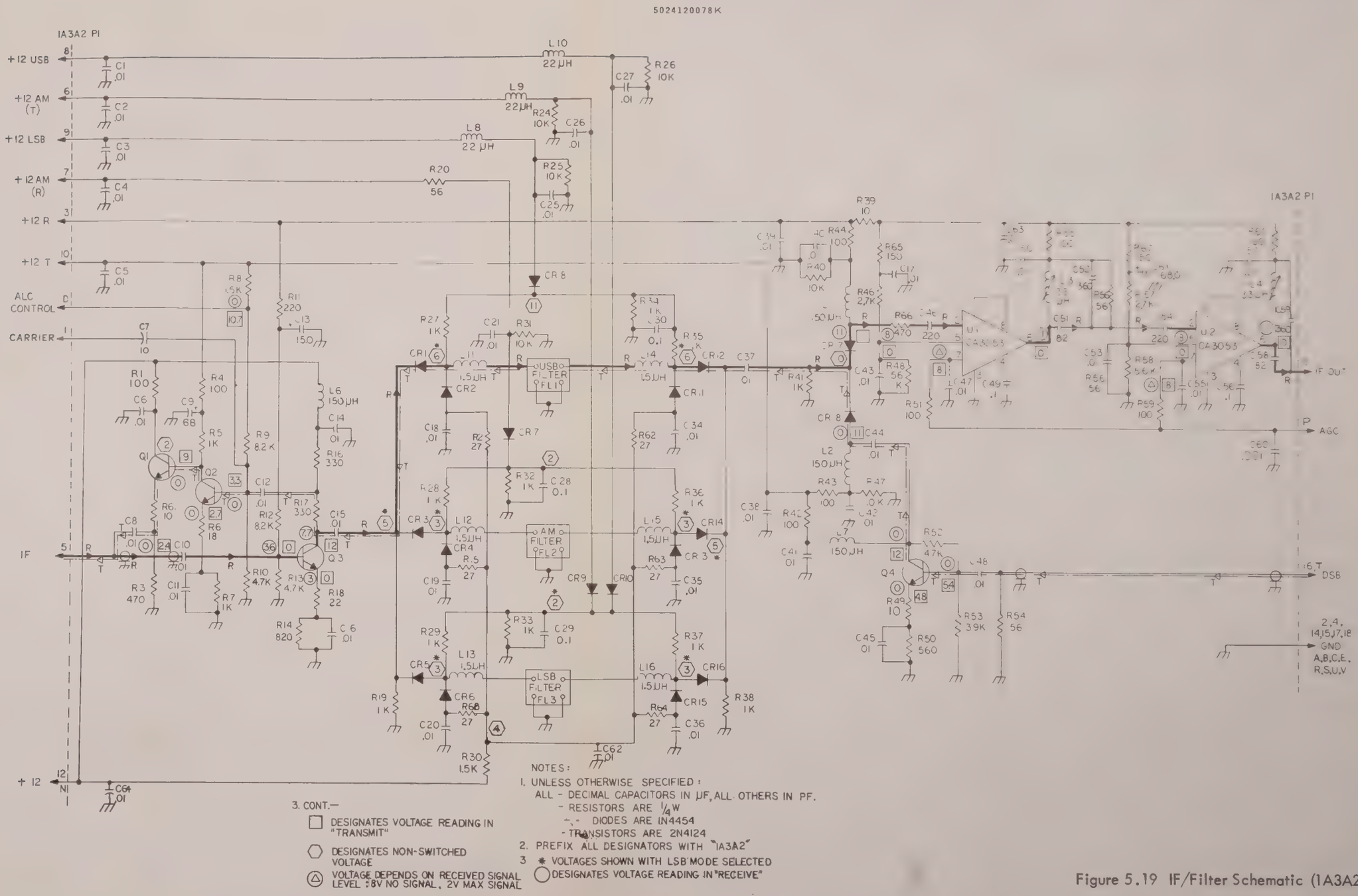
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY IF FILTER W/O FILTERS	5024120191
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C3	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C4	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C5	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C6	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C7	Capacitor, 10 PF, 500 V, DM10	0259830003
C8	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C9	Capacitor, 68 UF, 15 V, T368	0296540005
C10	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C11	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C12	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C13	Capacitor, 15 UF, 15 V, 196 D	0281720002
C14	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C15	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C16	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C17	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C19	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C20	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C21	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C22	Not used	
C23	Not used	
C24	Not used	
C25	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C25	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C26	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C27	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C28	Capacitor, 0.1 UF, 50 V, , X7 R, 20%	0281610002
C29	Capacitor, 0.1 UF, 50 V, X7 R	0281610002
C30	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C31	Not used	
C32	Not used	
C33	Not used	
C34	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C35	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C36	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C37	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C38	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C39	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C40	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C41	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C42	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C43	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C44	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C45	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C46	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C47	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C48	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C49	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C50	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C51	Capacitor, 82 PF, 500 V, DM10, 5%	0262120003
C52	Capacitor, 360 PF, 500 V, DM15, 5%	0275150003
C53	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C54	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C55	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C56	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C57	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C58	Capacitor, 82 PF, 500 V, DM10, 5%	0262120003
C59	Capacitor, 360 PF, 500 V, DM15, 5%	0275150003
C60	Capacitor, 0.001 UF, 100 V, X5E, 10%	0282080007
C61	Capacitor, 68 UF, 15 V, T368	0296540005
C62	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C63	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C64	Capacitor, 0.01 UF, 25 V, X5S	0281620008
CR1	Diode, Signal, Sil. 1 N4454	0405270003
CR2	Diode, Signal, Sil. 1 N4454	0405270003
CR3	Diode, Signal, Sil. 1 N4454	0405270003
CR4	Diode, Signal, Sil. 1 N4454	0405270003
CR5	Diode, Signal, Sil. 1 N4454	0405270003
CR6	Diode, Signal, Sil 1 N4454	0405270003
CR7	Diode, Signal, Sil 1 N4454	0405270003
CR8	Diode, Signal, Sil 1 N4454	0405270003
CR9	Diode, Signal, Sil. 1 N4454	0405270003

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
CR10	Diode, Signal, Sil. 1 N4454	0405270003
CR11	Diode, Signal, Sil. 1 N4454	0405270003
CR12	Diode, Signal, Sil. 1 N4454	0405270003
CR13	Diode, Signal, Sil. 1 N4454	0405270003
CR14	Diode, Signal, Sil. 1 N4454	0405270003
CR15	Diode, Signal, Sil. 1 N4454	0405270003
CR16	Diode, Signal, Sil. 1 N4454	0405270003
CR17	Diode, Signal, Sil. 1 N4454	0405270003
CR18	Diode, Signal, Sil. 1 N4454	0405270003
FL1	Filter, Crystal, LSB, 10.5 MHz	0818250003
FL2	Filter, Crystal, AM, 10.5 MHz	0818270004
FL3	Filter, Crystal, USB, 10.5 MHz	0818260009
L1	Inductor, Molded, 150 UH, 5%	0659190001
L2	Inductor, Molded, 150 UH, 5%	0659190001
L3	Inductor, Var, 3.30 UH	0647930005
L4	Inductor, Var. 3.30 UH	0674930005
L5	Not used	
L6	Inductor, Molded, 150 UH, 5%	0659190001
L7	Inductor, Molded, 150 UH, 5%	0659190001
L8	Inductor, Molded, 22 UH, 5%	0650000005
L9	Inductor, Molded, 22 UH, 5%	0650000005
L10	Inductor, Molded, 22 UH, 5%	0650000005
L11	Inductor, Molded, 1.5 UH, 5%	0649270002
L12	Inductor, Molded, 1.5 UH, 5%	0649270002
L13	Inductor, Molded, 1.5 UH, 5%	0649270002
L14	Inductor, Molded, 1.5 UH, 5%	0649270002
L15	Inductor, Molded, 1.5 UH, 5%	0649270002
L16	Inductor, Molded, 1.5 UH, 5%	0649270002
Q1	Transistor, NPN, Si. 2 N4124	0448010003
Q2	Transistor, NPN, Si. 2 N4124	0448010003
Q3	Transistor, NPN, Si. 2 N4124	0448010003
Q4	Transistor, NPN, Si. 2 N4124	0448010003
R1	Resistor, 100, 5%, 1/4 W	0171180003
R2	Resistor, 27, 10%, 1/4 W	0172590001
R3	Resistor, 470, 5%, 1/4 W	0184110009
R4	Resistor, 100, 5%, 1/4 W	0711180003
R5	Resistor, 1 K, 10%, 1/4 W	0171560001
R6	Resistor, 18, 10%, 1/4 W	0184590001
R7	Resistor, 1 K, 10%, 1/4 W	0171560001
R8	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R9	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R10	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R11	Resistor, 220, 10%, 1/4 W	0171320000
R12	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R13	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R14	Resistor, 820, 10%, 1/4 W	0178210005
R15	Resistor, 27, 10%, 1/4 W	0172590001
R16	Resistor, 330, 5%, 1/4 W	0170910008
R17	Resistor, 330, 5%, 1/4 W	0170910008
R18	Resistor, 22, 10%, 1/4 W	0192690001
R19	Resistor, 1 K, 10%, 1/4 W	0171560001
R20	Resistor, 56, 10%, 1/4 W	0174290004
R21	Not used	
R22	Not used	
R23	Not used	
R24	Resistor, 10 K, 10%, 1/4 W	0170410005
R25	Resistor, 10 K, 10%, 1/4 W	0170410005
R26	Resistor, 10 K, 10%, 1/4 W	0170410005
R27	Resistor, 1 K, 10%, 1/4 W	0171560001
R28	Resistor, 1 K, 10%, 1/4 W	0171560001
R29	Resistor, 1 K, 10!, 1/4 W	0171560001
R30	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R31	Resistor, 10 K, 10%, 1/4 W	0170410005
R32	Resistor, 1 K, 10%, 1/4 W	0171560001
R33	Resistor, 1 K, 10%, 1/4 W	0171560001
R34	Resistor, 1 K, 10%, 1/4 W	0171560001
R35	Resistor, 1 K, 10%, 1/4 W	0171560001
R36	Resistor, 1 K, 10%, 1/4 W	0171560001
R37	Resistor, 1 K, 10%, 1/4 W	0171560001
R38	Resistor, 1 K, 10%, 1/4 W	0171560001
R39	Resistor, 10, 5%, 1/4 W	0177160004
R40	Resistor, 10 K, 10%, 1/4 W	0170410005
R41	Resistor, 1 K, 10%, 1/4 W	0171560001
R42	Resistor, 100, 5%, 1/4 W	0171180003

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R43	Resistor, 100, 5%, 1/4 W	0171180003
R44	Resistor, 100, 5%, 1/4 W	0171180003
R45	Not used	
R46	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R47	Resistor, 10 K, 10%, 1/4 W	0170410005
R48	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R49	Resistor, 10, 5%, 1/4 W	0177160004
R50	Resistor, 560, 5%, 1/4 W	0183200004
R51	Resistor, 100, 5%, 1/4 W	0171180003
R52	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R53	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R54	Resistor, 56, 10%, 1/4 W	0174290004
R55	Resistor, 100, 5%, 1/4 W	0171180003
R56	Resistor, 56, 10%, 1/4 W	0172490004
R57	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R58	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R59	Resistor, 100, 5%, 1/4 W	0171180003
R60	Resistor, 100, 5%, 1/4 W	0171180003
R61	Resistor, 10, 5%, 1/4 W	0177160004
R62	Resistor, 27, 10%, 1/4 W	0172590001
R63	Resistor, 27, 10%, 1/4 W	0175290001
R64	Resistor, 27, 10%, 1/4 W	0175290001
R65	Resistor, 150, 10%, 1/4 W	0172730007
R66	Resistor, 470, 5%, 1/4 W	0184110009
R67	Resistor, 150, 10%, 1/4 W	0172730007
R68	Resistor, 27, 10%, 1/4 W	0172590001
U1	IC Linear CA3053	0448060001
U2	IC Linear CA3053	0448060001







NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   - ALL DECIMAL CAPACITORS IN µF, ALL OTHERS IN PF.
   - RESISTORS ARE 1/4 W
   - DIODES ARE IN4454
   - TRANSISTORS ARE 2N4124
2. PREFIX ALL DESIGNATORS WITH "1A3A2"
3. * VOLTAGES SHOWN WITH LSB MODE SELECTED
   ◯ DESIGNATES VOLTAGE READING IN "RECEIVE"

3. CONT.—
   □ DESIGNATES VOLTAGE READING IN "TRANSMIT"
   ⬡ DESIGNATES NON-SWITCHED VOLTAGE
   △ VOLTAGE DEPENDS ON RECEIVED SIGNAL LEVEL: 8V NO SIGNAL, 2V MAX SIGNAL

Figure 5.19 IF/Filter Schematic (1A3A2)

5024140095M PC ASSY AUDIO

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY AUDIO	5024140095
C1	Capacitor, 47 UF, 20 V, 196 D	0281700001
C2	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C3	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C4	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C5	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C6	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C7	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C8	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C9	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C10	Capacitor, 15 UF, 20 V, 198 D	0280920008
C11	Capacitor, 68 UF, 25 V, T368	0282150005
C12	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C13	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C14	Capacitor, 15 UF, 20 V, 198 D	0280920008
C15	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C16	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C17	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C18	Capacitor, 68 UF, 25 V, T368	0282150005
C19	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C20	Capacitor, 15 UF, 20 V, 198 D	0280920008
C21	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C22	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C23	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C24	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C25	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C26	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C27	Capacitor, 1 UF, 50 V, 198 D	0280910002
C28	Capacitor, 1 UF, 50 V, 198 D	0280910002
C29	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C30	Capacitor, 1 UF, 50 V, 198 D	0280910002
C31	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C32	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C33	Capacitor, 1 UF, 50 V, 198 D	0280910002
C34	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C35	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C36	Capacitor, 1 UF, 50 V, 198 D	0280910002
C37	Capacitor, 47 UF, 20 V, 196 D	0281700001
C38	Capacitor, 68 UF, 25 V, T368	0282150005
C39	Capacitor, 15 UF, 20 V, 198 D	0280920008
C40	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C41	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C42	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C43	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C44	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C45	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C46	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C47	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C48	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C49	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C50	Capacitor, 910 PF, 500 V, DM19, 5%	0297570005
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003
CR3	Diode, Signal, Sil. 1N4454	0405270003
CR4	Diode, Signal, Sil. 1N4454	0405270003
L1	Inductor, Molded, 150 UH, 5%	0646780000
Q1	Transistor, NPN, Si. 2N4124	0448010003
Q2	Transistor, NPN, Si. 2N4124	0448010003
Q3	Transistor, NPN, Si. 2N4124	0448010003
Q4	Transistor, NPN, Si. 2N4124	0448010003
Q5	Transistor, PNP, Si. 2N4126	0448020009
Q6	Transistor, NPN, Si. 2N4124	0448010003
Q7	Transistor, NPN, Si. 2N4124	0448010003
Q8	Transistor, NPN, Si. 2N4124	0448010003
Q9	Transistor, NPN, Si. 2N4124	0448010003
Q10	Transistor, NPN, Si. 2N4124	0448010003
Q11	Transistor, NPN, Si. 2N4124	0448010003
Q12	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 12 K, 10%, 1/4 W	0183180003
R2	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R3	Resistor, 220, 10%, 1/4 W	0171320000
R4	Resistor, 560, 5%, 1/4 W	0183200004
R5	Resistor, 18, 10%, 1/4 W	0184590001
R6	Resistor, 56, 10%, 1/4 W	0174290004
R7	Resistor, 1.8 K, 10%, 1/4 W	0178190004

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R8	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R9	Resistor, 18, 10%, 1/4 W	0184590001
R10	Resistor, 680, 10%, 1/4 W	0176630007
R11	Resistor, 22 K, 5%, 1/4 W	0172230004
R12	Resistor, 3 K, 5%, 1/4 W	0197180001
R13	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R14	Resistor, 120, 10%, 1/4 W	0186550006
R15	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R16	Resistor, 33 K, 10%, 1/4 W	0177920009
R17	Resistor, 120 K, 10%, 1/4 W	0175100004
R18	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R19	Resistor, 100, 5%, 1/4 W	0171180003
R20	Resistor, 1 K, 10%, 1/4 W	0171560001
R21	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R22	Resistor, 1.2 K 10%, 1/4 W	0181860007
R23	Resistor, 120, 10%, 1/4 W	0186550006
R24	Resistor, 560, 5%, 1/4 W	0183200004
R25	Resistor, 56, 10%, 1/4 W	0174290004
R26	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R27	Resistor, 220, 10%, 1/4 W	0171320000
R28	Resistor, 18 K, 10%, 1/4 W	0171520002
R29	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R30	Resistor, 2.7 K, 10%, 1/4 W	0188670001
R31	Resistor, 270, 10%, 1/4 W	0178450006
R32	Resistor, 680, 10%, 1/4 W	0176630007
R33	Resistor, 82, 10%, 1/4 W	0184610001
R34	Resistor, 680, 10%, 1/4 W	0176630007
R35	Resistor, 33 K, 10%, 1/4 W	0177920009
R36	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R37	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R38	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R39	Resistor, 1.2 K, 10%, 1/4 W	0181860007
R40	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R41	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R42	Resistor, 680, 10%, 1/4 W	0176630007
R43	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R44	Resistor, 100 K, 10%, 1/4 W	0170390004
R45	Resistor, 10, 5%, 1/4 W	0177160004
R46	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R47	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R48	Pot., 2 K, 10%, 3/4 W, 15 Turns	0338490060
R49	Resistor, 18 K, 10%, 1/4 W	0175720002
R50	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R51	Resistor, 560, 5%, 1/4 W	0183200004
R52	Resistor, 470 K, 10%, 1/4 W	0180570005
R53	Resistor, 10, 5%, 1/4 W	0177160004
R54	Resistor, 1 K, 10%, 1/4 W	0171560001
R55	Resistor, 56, 10%, 1/4 W	0174290004
R56	Resistor, 4.7 K, 10%, 1/2 W	0195680006
R57	Resistor, 10, 5%, 1/4 W	0177160004
R58	Pot., 500, 10%, 3/4 W, 15 Turns	0338490078
R59	Resistor, 120, 10%, 1/4 W	0186550006
R60	Pot., 20, 10%, 1/2 W, 1 Turn	1000080030
R61	Resistor, 1 K, 10%, 1/4 W	0171560001
R62	Resistor, 560, 5%, 1/4 W	0183200004
R63	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R64	Resistor, 100, 5%, 1/4 W	0171180003
R65	Resistor, 10, 5%, 1/4 W	0177160004
R66	Resistor, 330, 5%, 1/4 W	0170910008
T1	Transformer, Audio, PC Mount	0491660006
T2	Transformer, Audio, PC Mount	0491650001
U1	IC Linear CA3020	0444600001
	Test Point, White	0753640007
	Heatsink, Transistor	0871870002
	Wire Kit, Audio Board Assy.	5024140001
	PCB, Audio	5024140206

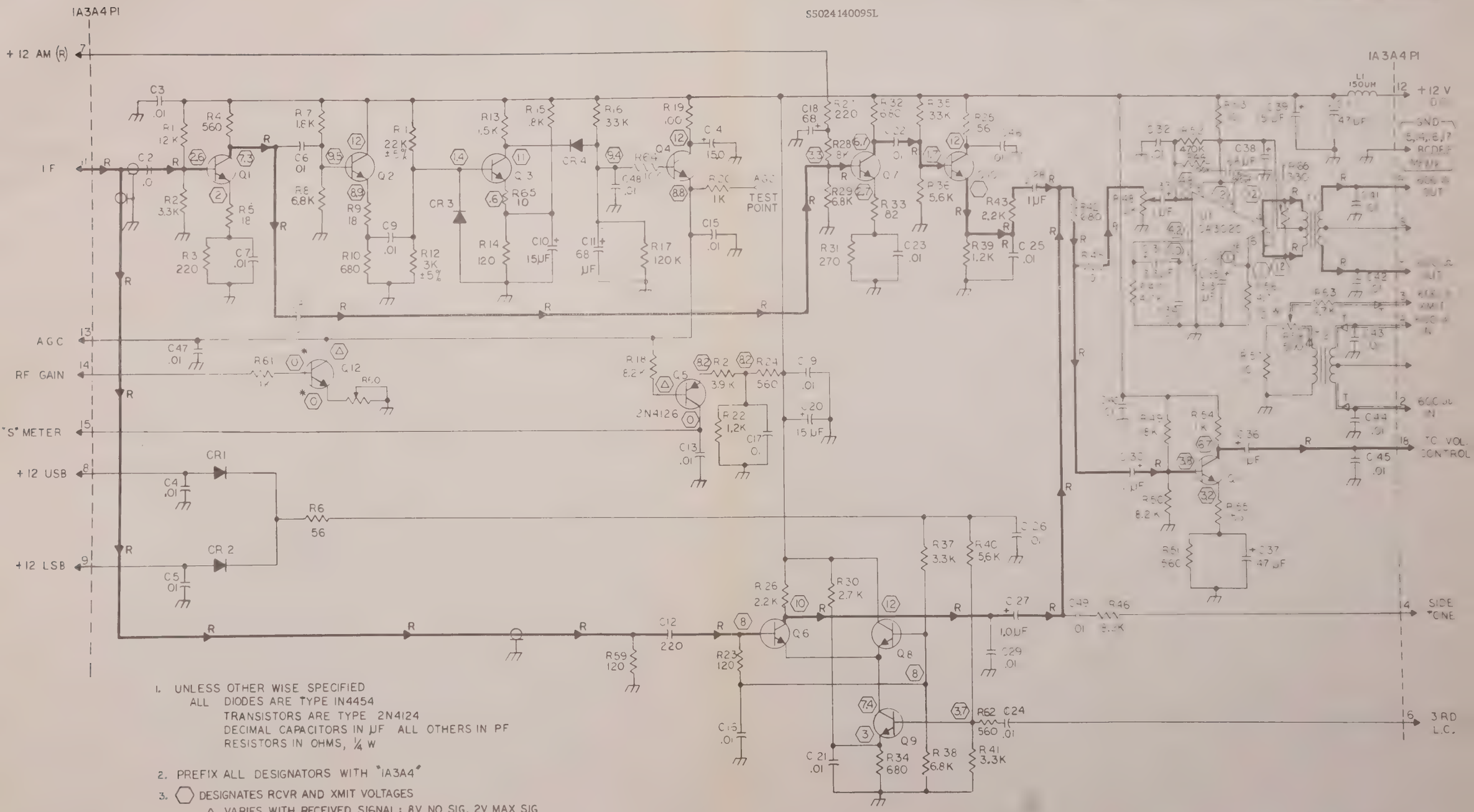
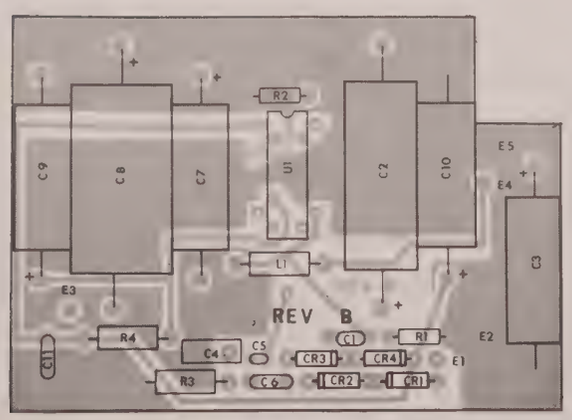


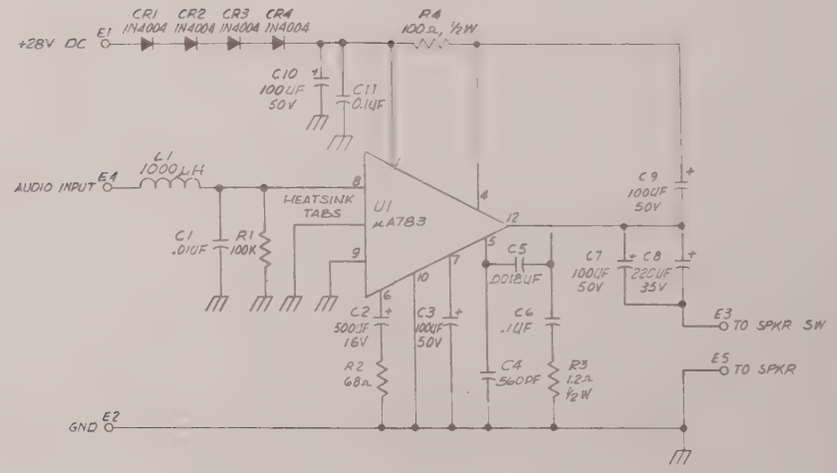
Figure 5.20 Audio Board Schematic (1A3A4)

5024041771E

5024041798N PC ASSY SPEAKER DRV.

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY SPEAKER DRV.	5024041798
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 500 UF, 15 V, Br	0273070002
C3	Capacitor, 100 UF, 50 V	1004260016
C4	Capacitor, 560 PF, 300 V, DM15, 5%	0283750006
C5	Capacitor, 1800 PF, 100 V, X7 R, 10%	0288690001
C6	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C7	Capacitor, 100 UF, 50 V	1004260016
C8	Capacitor, 220 UF, 35 V	0258160004
C9	Capacitor, 100 UF, 50 V	1004260016
C10	Capacitor, 100 UF, 50 V	1004260016
C11	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
CR1	Diode, Rectifier 1 N4004	0405180004
CR2	Diode, Rectifier 1 N4004	0405180004
CR3	Diode, Rectifier 1 N4004	0405180004
CR4	Diode, Rectifier 1 N4004	0405180004
L1	Inductor, Molded, 1000 UH, 10%	0664940005
R1	Resistor, 100 K, 10%, 1/4 W	0170390004
R2	Resistor, 68, 10%, 1/4 W	0187960003
R3	Resistor, 1.2, 10%, 1/2 W	0188490001
R4	Resistor, 100, 10%, 1/2 W	0174790007
U1	IC Linear UA 783 P	1004260024





NOTE: UNLESS OTHERWISE SPECIFIED
1. RESISTORS ARE ¼ WATT

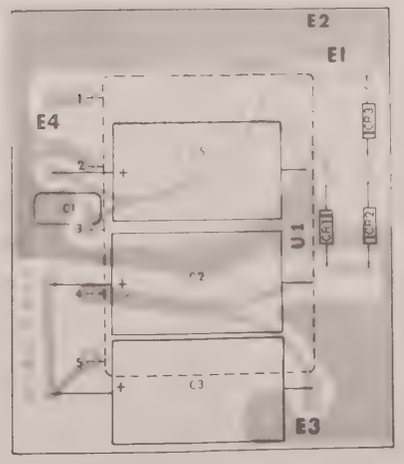
ON NEW TYPE BOARD 5024047095
ADD E6 TO PIN B ON MIKE JACK 1A1J8
E8 TO TIP SIDE KEY JACK 1A1J4

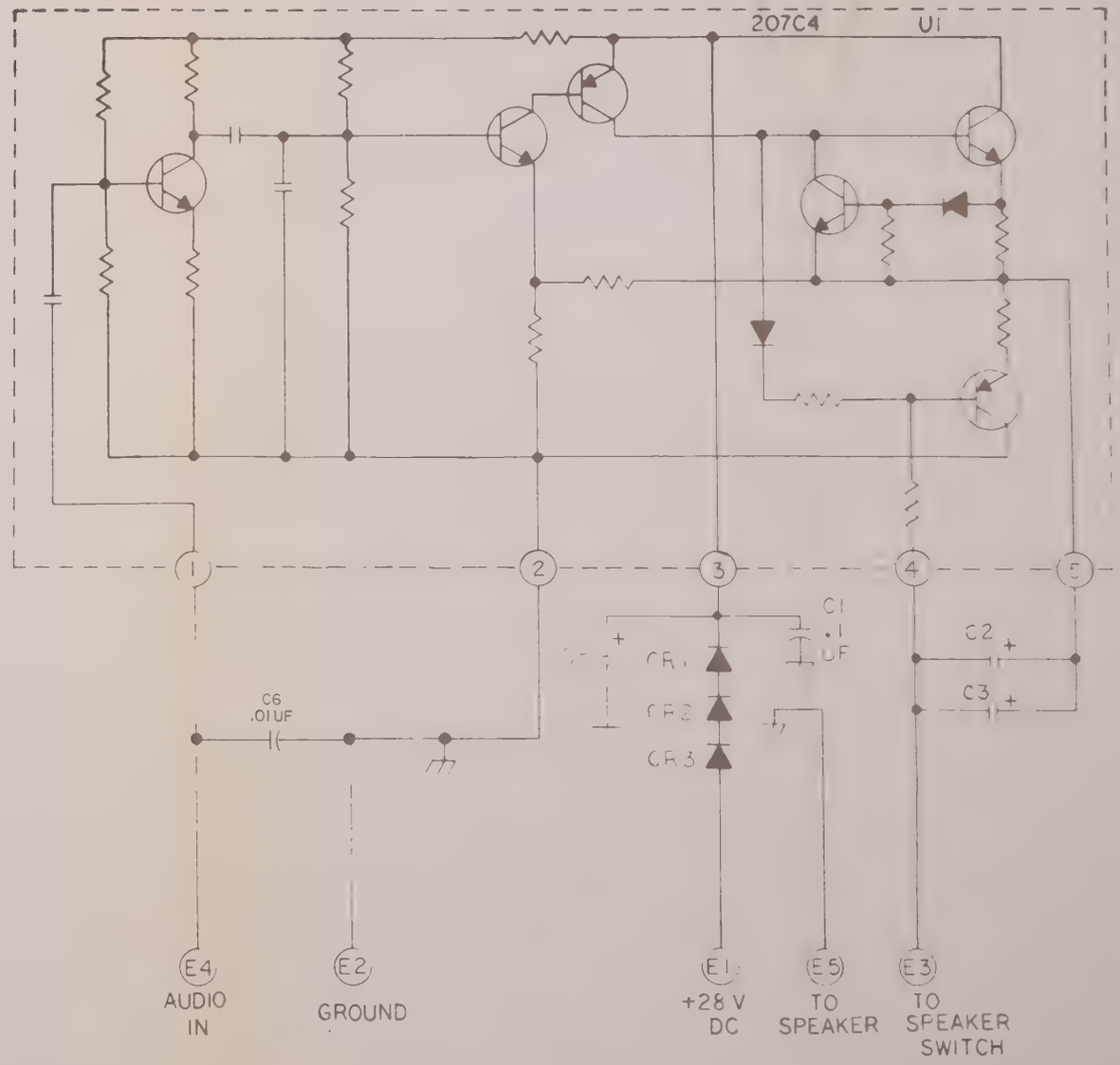
Figure 5.21 Speaker Driver Schematic (1A1A1)

S5024041709D

SPEAKER DRIVER BOARD

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PCB SPEAKER DRIVER	5024041801
C1	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C2	Capacitor, 470 UF, 50 V, TAL	0280890001
C3	Capacitor, 470 UF, 50 V, TAL	0280890001
C4	Not used	
C5	Capacitor, 470 UF, 50 V, TAL	0280890001
C6	Capacitor, 0.01 UF, 25 V	0281620008
CR1	Diode, Rectifier, 1 N4004	0405180004
CR2	Diode, Rectifier, 1 N4004	0405180004
CR3	Diode, Rectifier, 1 N4004	0405180004
U1	IC Linear, 207 C4 SC	0448260000





NOTES:

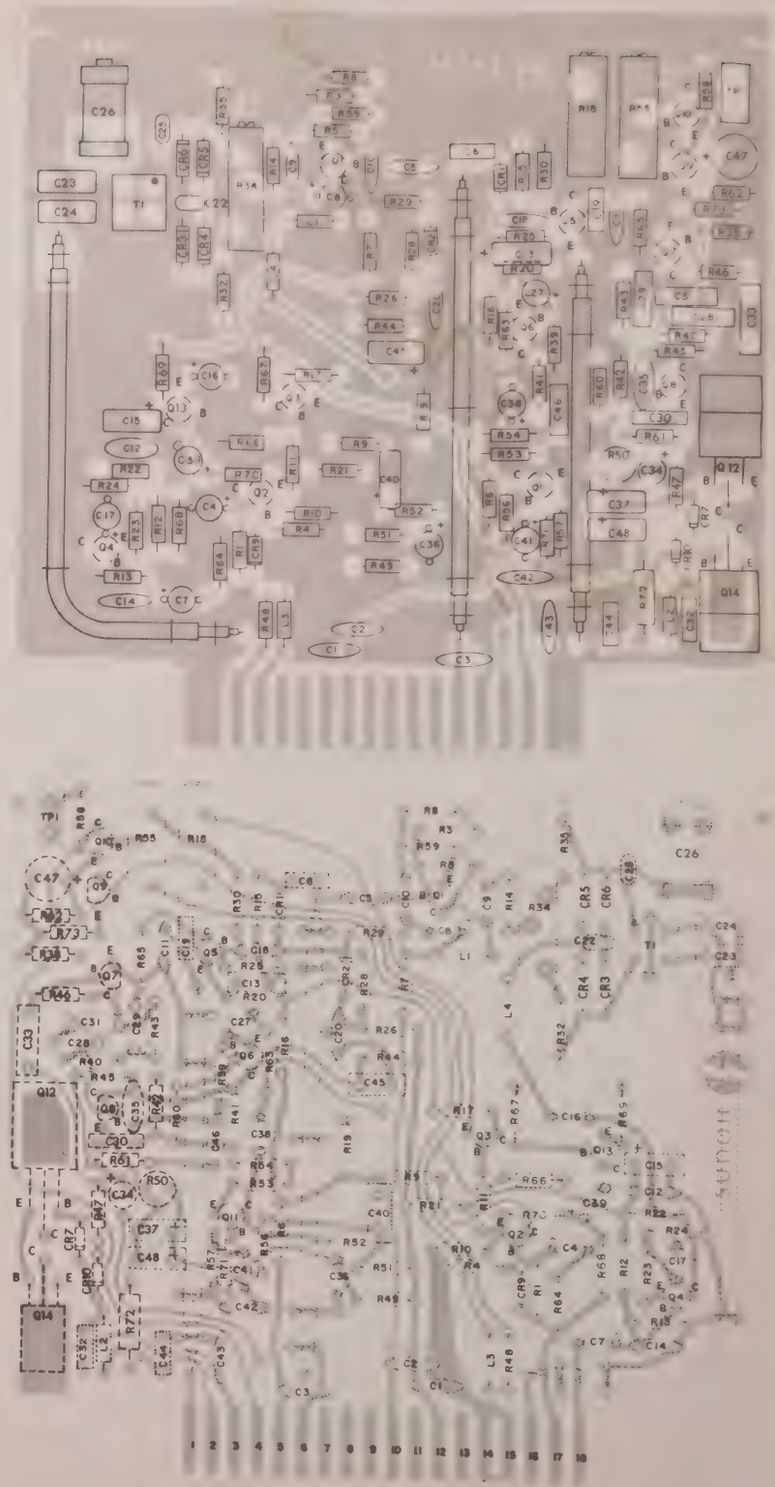
1. C1, C2, C3, C5 ARE 470 µF, 50V DCW
2. ALL DIODES ARE IN4004

Figure 5.21A Speaker Driver Schematic (1A1A1)

FOR MOD SEE PAGE 5-57

5024130090V PC ASSY SIDEBAND GENERATOR

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY SIDEBAND GENERATOR	5024130090
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C3	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C4	Capacitor, 15 UF, 20 V, 198 D	0280920008
C5	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C6	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007
C7	Capacitor, 1 UF, 50 V, 198 D	0280910002
C8	Capacitor, 15 UF, 20 V, 198 D	0280920008
C9	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C10	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C11	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C12	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C13	Capacitor, 68 UF, 15 V, T368	0296540005
C14	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C15	Capacitor, 68 UF, 15 V, T368	0296540005
C16	Capacitor, 1 UF, 50 V, 198 D	0280910002
C17	Capaacitor, 15 UF, 20 V, 198 D	0280920008
C18	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C19	Capacitor, 10 PF, 500 V, DM10	0259830003
C20	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C21	Not used	
C22	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C23	Capacitor, 360 PF, 500 V, DM15, 5%	0275150003
C24	Capacitor, 82 PF, 300 V, DM15, 5%	0289970008
C25	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C26	Capacitor, .8-8 PF, PC Mt. Glass	1000060012
C27	Capacitor, 1 UF, 50 V, 198 D	0280910002
C28	Capacitor, 0.0047 UF, 50 V, Mylar	0281540004
C29	Capacitor, 0.01 UF, 50 V, Mylar	0281560005
C30	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C31	Capacitor, 0.0047 UF, 50 V, Mylar	0281540004
C32	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C33	Capacitor, 0.1 UF, 50 V, Mylar	0281580006
C34	Capacitor, 360 PF, 500 V, DM15, 5%	0280910002
C35	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C36	Capacitor, 15 UF, 20 V, 198 D	0280920008
C37	Capacitor, 68 UF, 15 V, T368	0296540005
C38	Capacitor, 1 UF, 50 V, 198 D	0280910002
C39	Capacitor, 47 UF, 20 V, 196 D	0281700001
C40	Capacitor. 68 UF, 15 V, T368	0296540005
C41	Capacitor. 1 UF, 50 V, 198 D	0280910002
C42	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C43	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C44	Capacitor. 0.01 UF, 50 V, X7 R, 20%	0281610002
C45	Capacitor, 68 UF, 15 V, T368	0296540005
C46	Capacitor, .033 UF, 50 V, Mylar	0281770000
C47	Capacitor, 47 UF, 20 V, 196 D	0281700000
C48	Capacitor, 68 UF, 15 V, T368	0296540005
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003
CR3	Diode, Hot Carrier MBD102	1000210022
CR4	Diode, Hot Carrier MBD102	1000210022
CR5	Diode, Hot Carrier MBD102	1000210022
CR6	Diode, Hot Carrier MBD102	1000210022
CR7	Diode, Signal, Sil. 1N4454	0405270003
CR8	Not used	
CR9	Diode, Signal, Sil. 1N4454	0405270003
CR10	Diode, Signal, Sil. 1N4454	0405270003
L1	Inductor, Molded, 22 UH, 5%	0650000005
L2	Inductor, Molded, 150 UH, 5%	0659190001
L3	Inductor, Molded, 150 UH, 5%	0659190001
L4	Inductor, Molded, 22 UH, 5%	0650000005
Q1	Transistor, NPN, Si. 2N4124	0448010003
Q2	Transistor, NPN, Si. 2N4124	0448010003
Q3	Transistor, NPN, Si. 2N4124	0448010003
Q4	Transistor, NPN, Si. 2N4124	0448010003
Q5	Transistor, PNP, Si. 2N4126	0448020009
Q6	Transistor, NPN, Si. 2N4124	0448010003
Q7	Transistor, NPN, Si. 2N4124	0448010003
Q8	Transistor, NPN, Si. 2N4124	0448010003
Q9	Transistor, NPN, Si. 2N4124	0448010003
Q10	Transistor, NPN, Si. 2N4124	0448010003
Q11	Transistor, NPN, Si. 2N4124	0448010003
Q12	Transistor, PNP, Sil. T1P-32A	0448200007
Q13	Transistor, PNP, Si. 2N4126	0448020009
Q14	Transistor, NPN, Si. 2N4921	0448040000
R1	Resistor, 47 K, 10%, 1/4 W	0171060008
R2	Not used	
R3	Resistor, 1 K, 10%, 1/4 W	0171560001
R4	Resistor, 68 K, 10%, 1/4 W	0173520006
R5	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R6	Resistor, 100, 5%, 1/4 W	0171180003
R7	Resistor, 120, 10%, 1/4 W	0186550006
R8	Resistor, 120, 10%, 1/4 W	0186550006
R9	Resistor, 220, 10%, 1/4 W	0171320000
R10	Resistor, 10 K, 10%, 1/4 W	0170410005
R11	Resistor, 1 K, 10%, 1/4 W	0171560001
R12	Resistor, 18 K, 10%, 1/4 W	0175720002
R13	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R14	Resistor, 100, 5%, 1/4 W	0171180003
R15	Resistor, 1 K, 10%, 1/4 W	0171560001
R16	Resistor, 1.2 K, 10%, 1/4 W	0181860007
R17	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R18	Pot. 500, 10%, 3/4 W, 15 Turns	0338490078
R19	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R20	Resistor, 100, 5%, 1/4 W	0171180003
R21	Resistor, 220, 10%, 1/4 W	0171320000
R22	Resistor, 820, 10%, 1/4 W	0178210005
R23	Resistor, 10, 5%, 1/4 W	0177160004
R24	Resistor, 560, 5%, 1/4 W	0183200004
R25	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R26	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R27	Not used	
R28	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R29	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R30	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R31	Not used	
R32	Resistor, 100, 5%, 1/4 W	0171180003
R33	Not used	
R34	Pot., 20, 10%, 3/4 W, 20 Turns	0346770009
R35	Resistor, 100, 5%, 1/4 W	0171180003
R36	Not used	
R37	Not used	
R38	Resistor, 15 K, 5%, 1/4 W	0195700007
R39	Resistor, 560, 5%, 1/4 W	0183200004
R40	Resistor, 33 K, 5%, 1/4 W	0195820002
R41	Resistor, 27 K, 10%, 1/4 W	0171200004
R42	Resistor, 47 K, 10%, 1/4 W	0171060008
R43	Resistor, 33 K, 5%, 1/4 W	0195820002
R44	Resistor, 220, 10%, 1/4 W	0171320000
R45	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R46	Resistor, 180 K, 10%, 1/4 W	0177280000
R47	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R48	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R49	Resistor, 1 K, 10%, 1/4 W	0171560001
R50	Pot. 10 K, 10%, 1/2 W, PC Mount	0346630002
R51	Resistor, 220, 10%, 1/4 W	0171320000
R52	Resistor, 820, 10%, 1/4 W	0178210005
R53	Resistor, 39, 10%, 1/4 W	0182890007
R54	Resistor, 390, 10%, 1/4 W	0178330001
R55	Pot., 5 K, 10%, 3/4 W 15 Turns	0338490086
R56	Resistor, 18 K, 10%, 1/4 W	0175720002
R57	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R58	Resistor, 1 K, 10&, 1/4 W	0171560001
R59	Resistor, 47, 10%, 1/4 W	0179360001
R60	Resistor, 180, 10%, 1/4 W	0175220000
R61	Resistor, 22 K, 5%, 1/4 W	0172230004
R62	Resistor, 10, 5%, 1/4 W	0177160004
R63	Resistor, 680, 10%, 1/4 W	0176630007
R64	Resistor, 1 K, 10%, 1/4 W	0171560001
R65	Resistor, 1 K, 10%, 1/4 W	0171560001
R66	Resistor, 10 K, 10%, 1/4 W	0170410005
R67	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R68	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R70	Resistor, 10 K, 10%, 1/4 W	0170410005
R71	Resistor, 100, 5%, 1/4 W	0171180003
R72	Resistor, 470, 10%, 1/2 W	0173900003
T1	Transformer, Balanced MOD	5024130308



S5024130090P

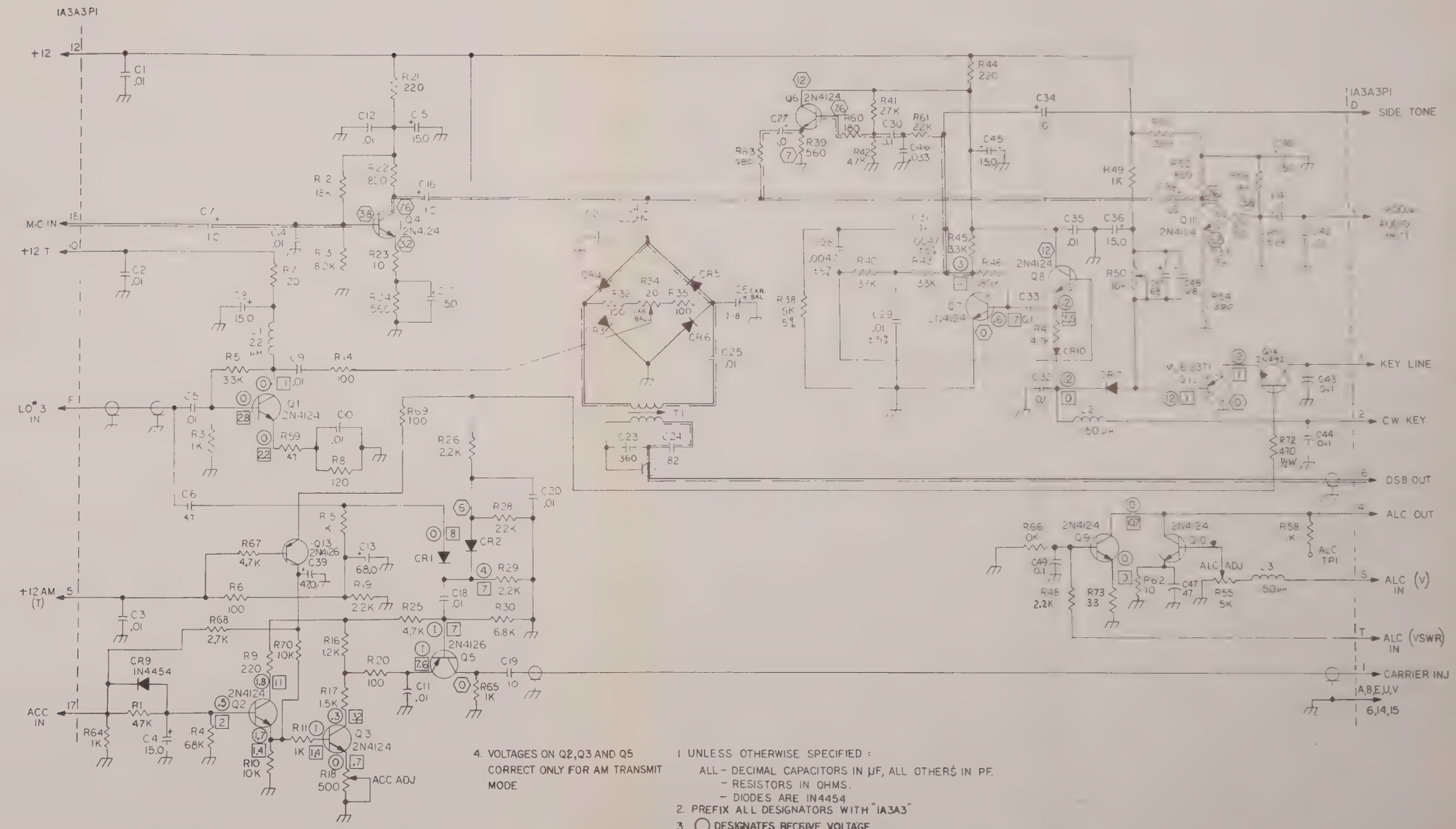
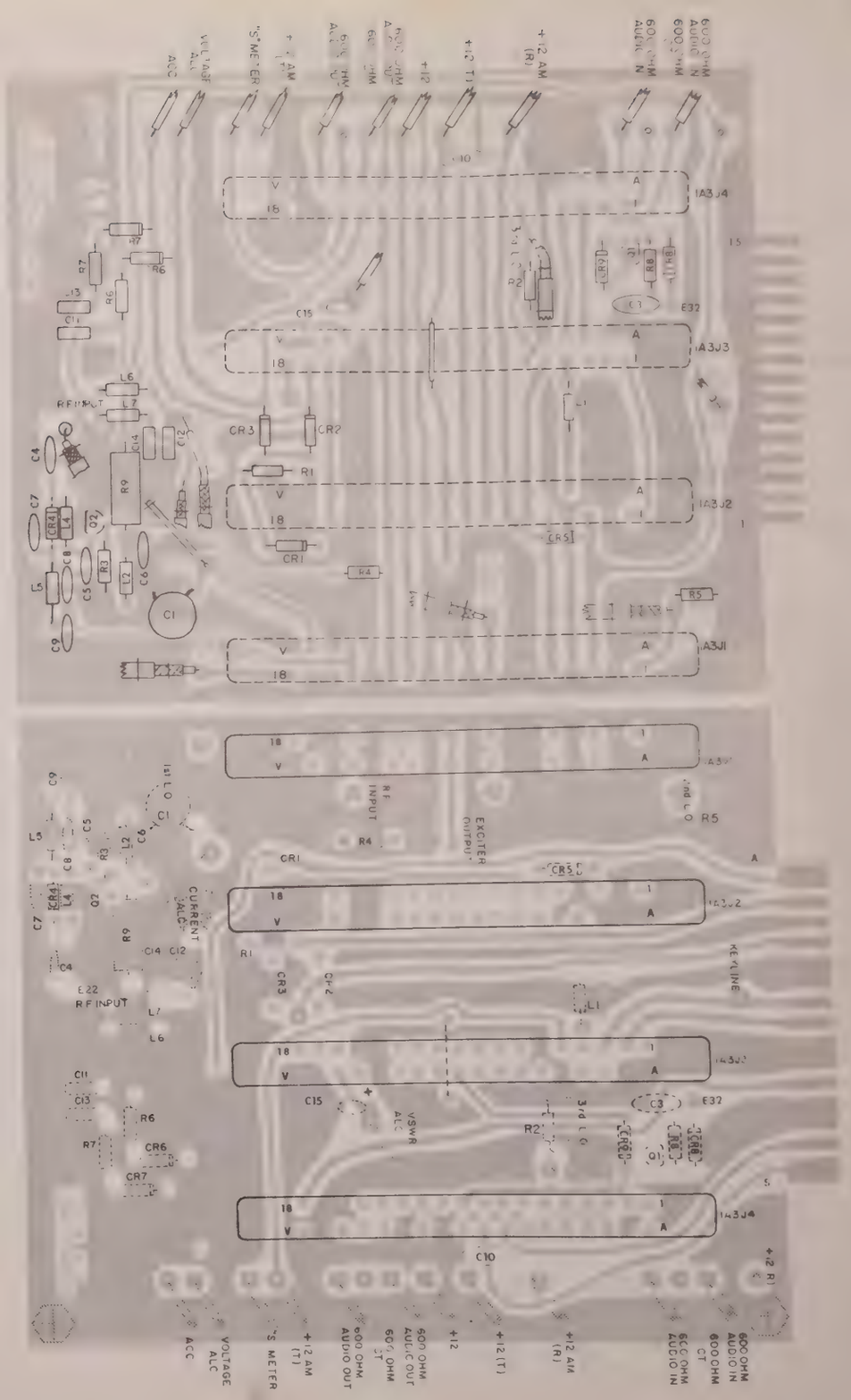


Figure 5.22 Sideband Generator Schematic (1A3A3)

5024011899L PC ASSY MOTHER BD. REC/EXC

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY MOTHER BD. REC/EXC	5024011899
C1	Capacitor, 2700 PF, 500 V, DM19, 2%	0281240001
C2	Not used	
C3	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C4	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C5	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C6	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C7	Capacitor, 51 PF, 500 V, DM15, 2%	0281350001
C8	Capacitor, 18 PF, 500 V, DM15	0281330000
C9	Capacitor, 51 PF, 500 V, DM15, 2%	0281350001
C10	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C11	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C12	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C13	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C14	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C15	Capacitor, 1 UF, 35 V, 196 D	0281660000
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003
CR3	Diode, Signal, Sil. 1N4454	0405270003
CR4	Diode, Pin 50823080	0405570007
CR5	Diode, Signal, Sil. 1N4454	0405270003
CR6	Diode, Signal, Sil. 1N4454	0405270003
CR7	Diode, Signal, Sil. 1N4454	0405270003

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
CR8	Diode, Signal, Sil. 1N4454	0405270003
CR9	Diode, Resistor, 1N4004	0405180004
J1	Connector, PC, 18 Pin, Female	0753610001
J2	Connector, PC, 18 Pin, Female	0753610001
J3	Connector, PC, 18 Pin, Female	0753610001
J4	Connector, PC, 18 Pin, Female	0753610001
L1	Inductor, Molded, 220 UH, 5%	0650500008
L2	Inductor, Molded, 220 UH, 5%	0650500008
L3	Not used	
L4	Inductor, Molded, 220 UH, 5%	0650500008
L5	Inductor, Molded, 0.15 UH, 5%	0648620000
L6	Inductor, Molded, 220 UH, 5%	0650500008
L7	Inductor, Molded, 220 UH, 5%	0650500008
Q1	Transistor, NPN, Si. 2N4124	0448010003
Q2	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 100, 5%, 1/4 W	0171180003
R2	Resistor, 56, 10%, 1/4 W	0174290004
R3	Resistor, 390, 10%, 1/4 W	0178390001
R4	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R5	Resistor, 56, 10%, 1/4 W	0174290004
R6	Resistor, 100 K, 10%, 1/4 W	0170390004
R7	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R8	Resistor, 10 K, 10%, 1/4 W	0170410005
R9	Resistor, 180, 10%, 1W	1000850030
	Key, Polarizing Connector	0753620006



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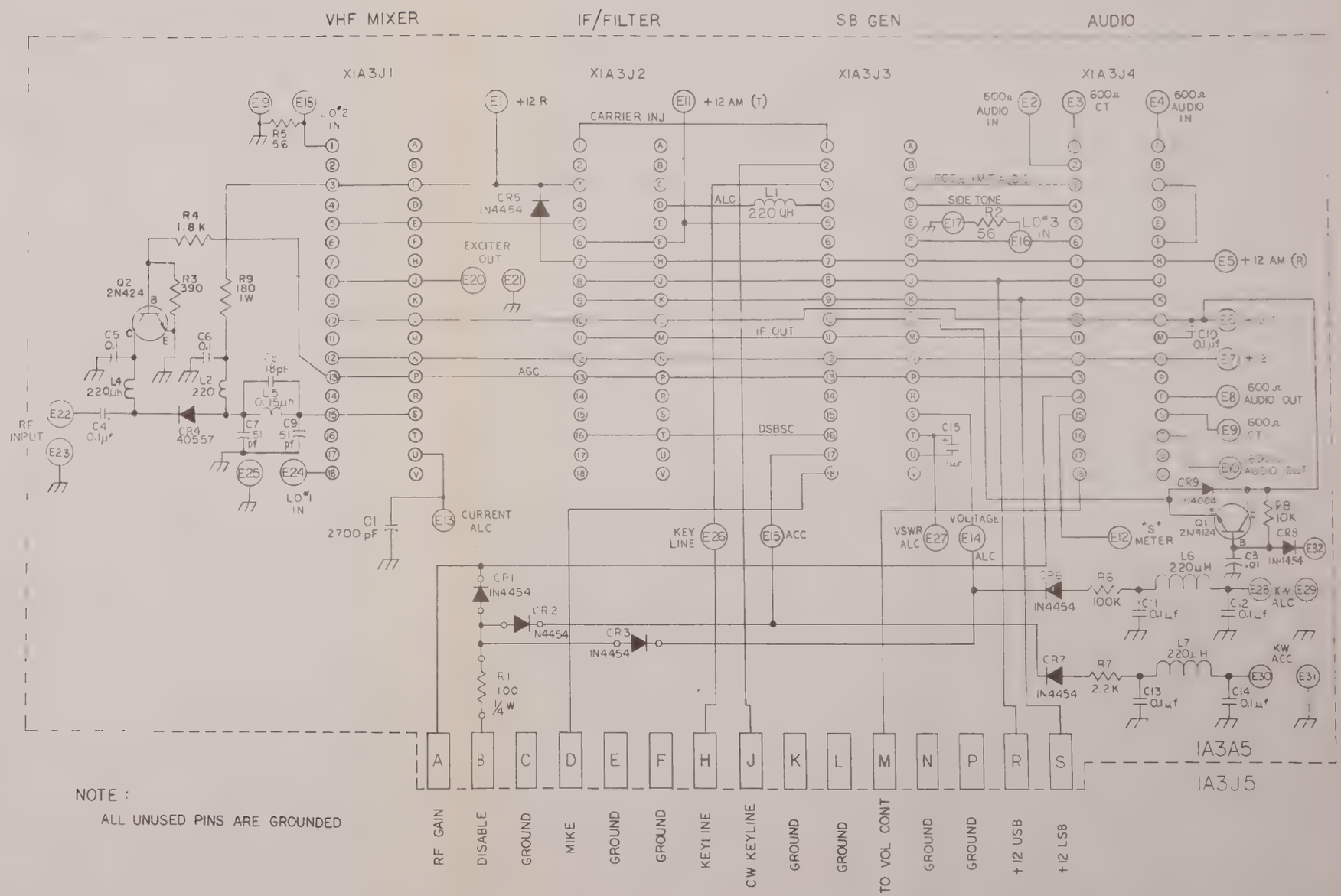


NOTE :

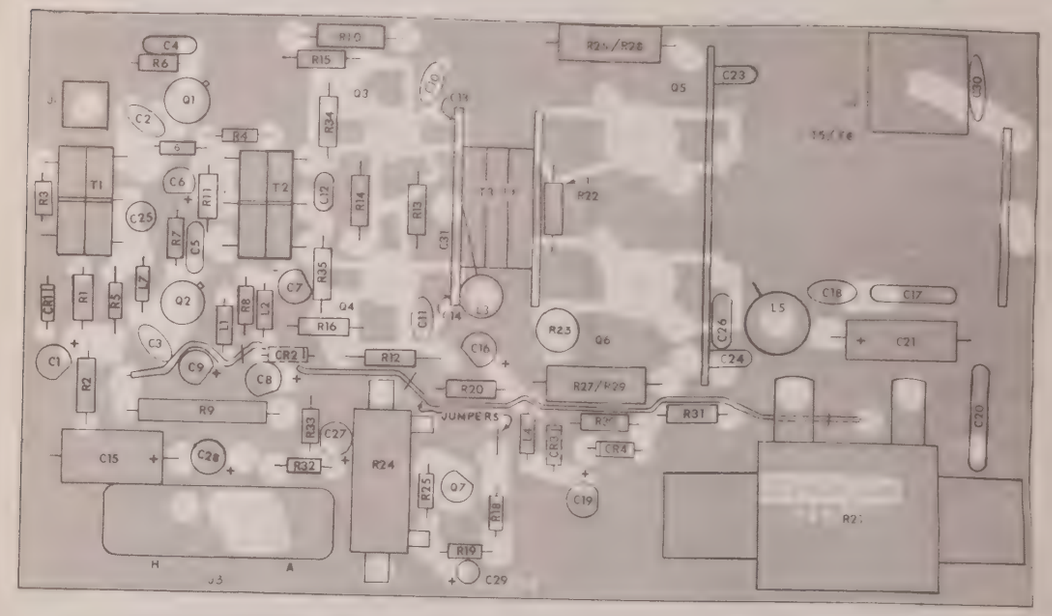
ALL UNUSED PINS ARE GROUNDED

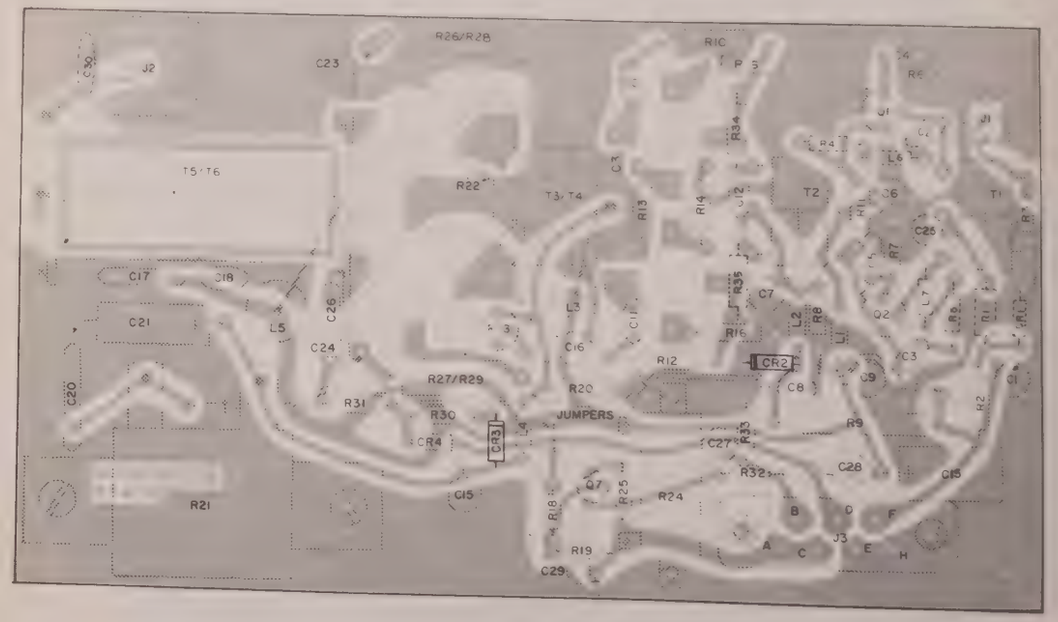
Figure 5.23 Receiver/Exciter Mother Board Schematic (1A3A5)

5024030192N PC ASSY POWER AMPLIFIER

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	POWER AMPLIFIER ASSY	5024030095
C1	Not used	
C2	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C3	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C4	Capacitor, 0.0022 UF, 200 V, Z5 F, 10%	0272780006
C5	Capacitor, 0.0022 UF, 200 V, Z5 F, 10%	0272780006
C6	Capacitor, 1 UF, 50 V, 198 D	0280910002
C7	Capacitor, 1 UF, 50 V, 198 D	0280910002
C8	Capacitor, 1 UF, 50 V, 198 D	0280910002
C9	Capacitor, 1 UF, 50 V, 198 D	0280910002
C10	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C11	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C12	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C13	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C14	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C15	Capacitor, 47 UF, 50 V, CL65 B	0245750002
C16	Capacitor, 1 UF, 50 V, 198 D	0280910002
C17	Capacitor, 0.01 UF, 250 V, Z5 R, 10%	0280950004
C18	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C19	Capacitor, 1 UF, 50 V, 198 D	0280910002
C20	Not used	
C21	Capacitor, 125 UF, 3 V	0266020003
C22	Not used	
C23	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C24	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C25	Capacitor, 47 UF, 20 V, 196 D	0281700001
C26	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C27	Capacitor, .22 UF, 35 V, T368	0283510005
C28	Capacitor, 47 UF, 20 V, 196 D	0281700001
C29	Capacitor, 1 UF, 50 V, 198 D	0280910002
C30	Capacitor, 51 PF, 500 V, DM15, 2%	0281350001
C31	Capacitor, 7-35 PF, 160 V, N1500	0287390004
CR1	Diode, Signal, Sil. 1 N4454	0405270003
CR2	Diode, Rectifier, , 1 N4004	0415180004
CR3	Diode, Rectifier 1 N4004	0405180004
CR4	Diode, Signal, Sil. 1 N4454	0405270003
J1	Connector, RF, JCM	0753600005
J2	Connector, RF, BNC	0753490005
J3	Connector, Power, 7 Pin Rect.	0753590000
L1	Inductor, Molded, 22 UH, 5%	0650000005
L2	Inductor, Molded, 6.8 UH, 5%	0659210002
L3	Choke, RF	5024030605
L4	Inductor, Molded, 2.7 UH, 5%	0652180001
L5	Choke, RF	5024030702
L6	Inductor, Molded, 2.7 UH, 5%	0652180001
L7	Inductor, Molded, 2.7 UH, 5%	0652180001
Q1	Transistor, NPN, Si. 2 N3866	0448140004
Q2	Transistor, NPN, Si. 2 N3866	0448140004
Q3	Transistor, NPN, SI PT6619	0448150000
Q4	Transistor, NPN SI PT6619	0448150000
Q5	Transistor, NPN Si	0448170001
Q6	Transistor, NPN Si	0448170001
R1	Resistor, 10, 5%, 1/4 W	0177160004
R2	Resistor, 1 K, 10%, 1/2 W	0167480006
R3	Resistor, 82, 10%, 1/4 W	0184610001
R4	Resistor, 330, 5%, 1/4 W	0170910008
R5	Resistor, 330, 5%, 1/4 W	0170910008
R6	Resistor, 10, 5%, 1/4 W	0177160004
R7	Resistor, 10, 5%, 1/4 W	0177160004
R8	Resistor, 22, 10%, 1/4 W	0192690001
R9	Resistor, 300, 5%, 5 W	0161140009
R10	Resistor, 820, 10%, 1/2 W	0175600007
R11	Resistor, 1 K, 10%, 1/2 W	0167480006
R12	Resistor, 820, 10%, 1/2 W	0175600007
R13	Resistor, 1, 10%, 1/2 W	0194770001
R14	Resistor, 1, 10%, 1/2 W	0194770001
R15	Resistor, 1, 10%, 1/2 W	0194770001
R16	Resistor, 1, 10%, 1/2 W	0194770001
R17	Not used	
R18	Resistor, 1 K, 10%, 1/2 W	0167480006
R19	Resistor, 3.3 K, 5%, 1/2 W	0184090008
R20	Resistor, 3.3, 10%, 1/2 W	0186050003
R21	Resistor, 50, 10%, 30 W	0193240009
R22	Resistor, 39, 10%, 1/2 W	0165920009

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R23	Pot., 10, 5%, 1/2 W, PC Mount	0346380006
R24	Resistor, 0.1, 10%, 15 W	0193360004
R25	Resistor, 470, 10%, 1/4 W	0172610001
R26	Resistor, 10, 10%, 2 W	0163840008
R27	Resistor, 10, 10%, 2 W	0163840008
R28	Resistor, 10, 10%, 2 W	0163840008
R29	Resistor, 10, 10%, 2 W	0163840008
R30	Resistor, 150, 10%, 1/4 W	0172730007
R31	Resistor, 5.1 K, 5%, 1/2 W	0183700007
R32	Resistor, 470, 10%, 1/4 W	0172610001
R33	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R34	Resistor, 2.2, 10%, 1/2 W	0178690007
R35	Resistor, 2.2, 10%, 1/2 W	0178690007
T1	Transformer Input	5024030401
T2	Transformer Interstage	5024030508
	Thermal Compound DNP	0840810008
	Heat Sink, PA	5024031407
	Heat Sink	0840730004
	Clip, Component	0533320003





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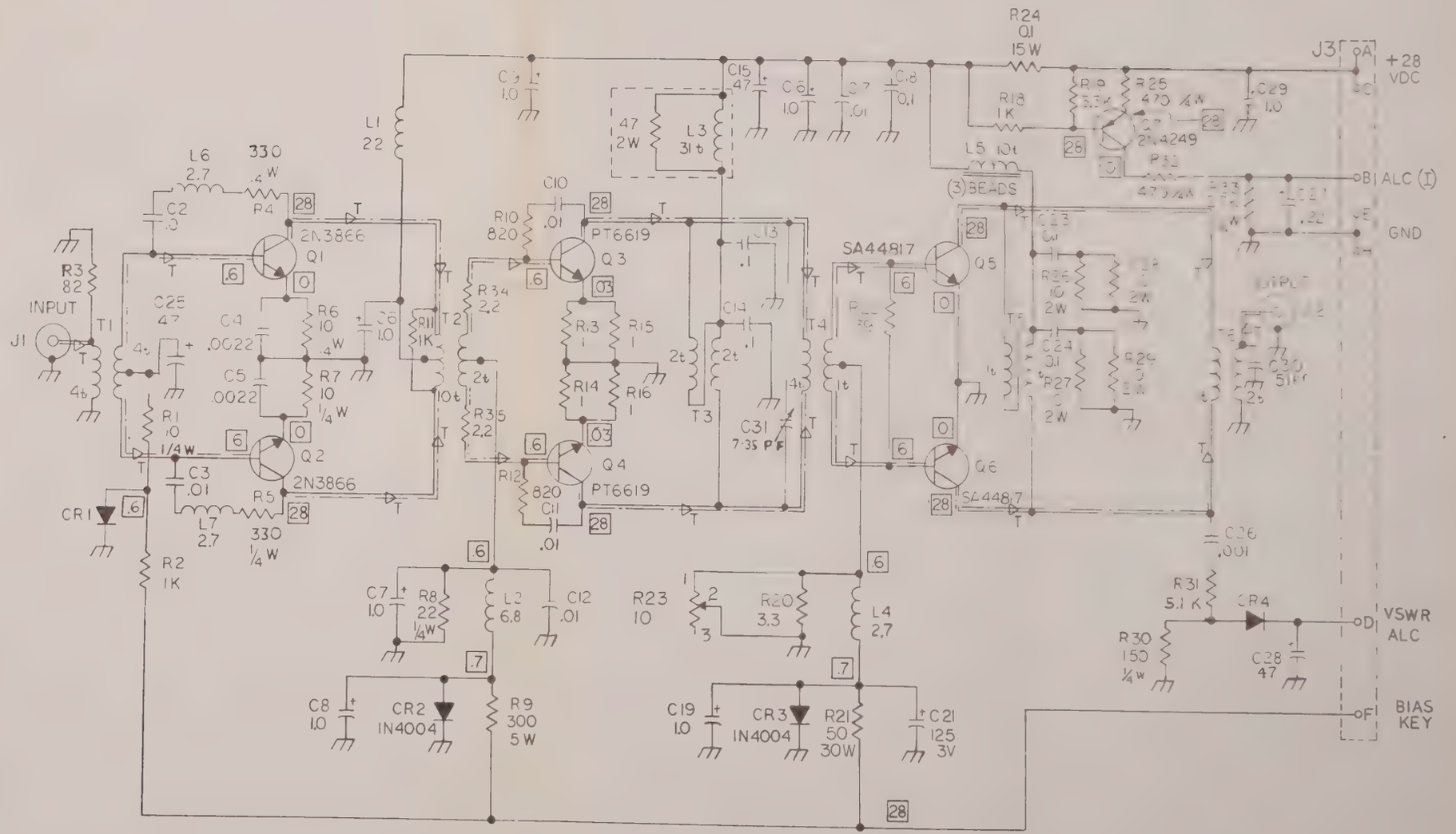


UNLESS OTHERWISE SPECIFIED:

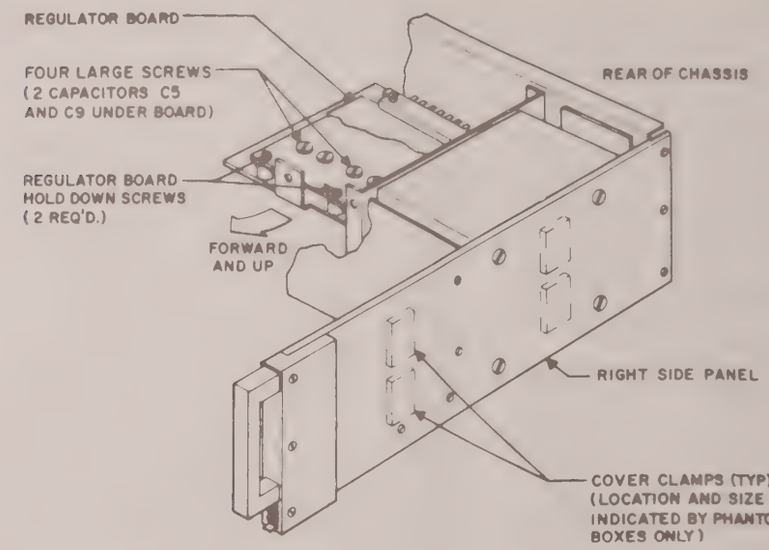
1. ALL—RESISTORS IN OHMS, 1/2 W
   —CAPACITORS IN μF
   —INDUCTORS IN μH
   —DIODES ARE IN4454
2. PREFIX ALL DESIGNATORS WITH "1A7A1"
3. UNUSED DESIGNATORS:
   R17 C1, C20
4. VOLTAGES ARE GIVEN WITH XMTR KEYED IN SSB AND NO MODULATION

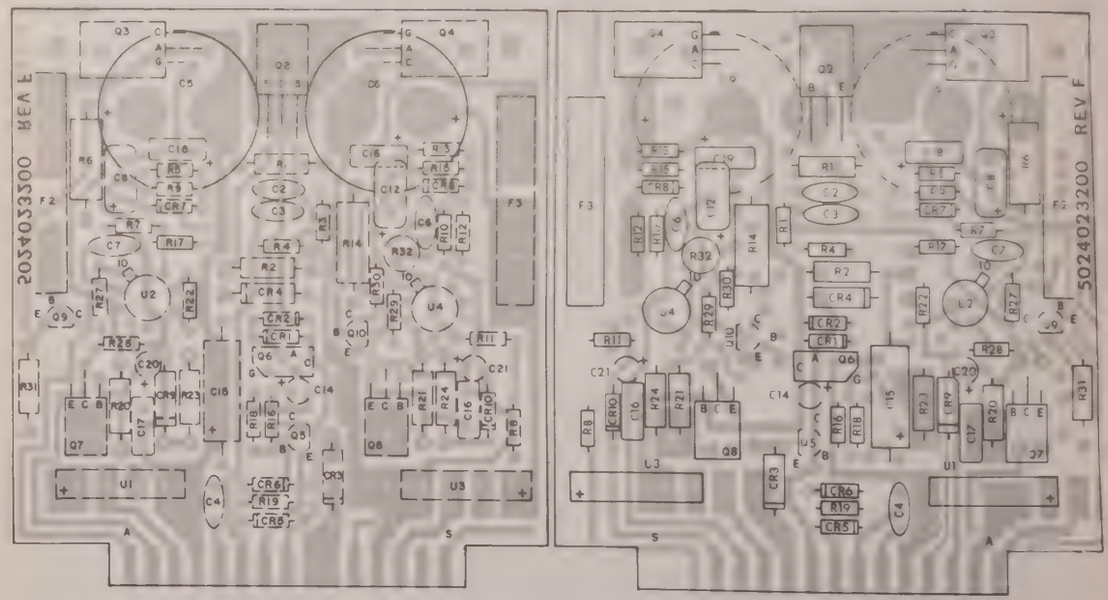
Figure 5.24 RF Power Amplifier Schematic (1A7A1)

1001220005F PC ASS'Y REGULATOR

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Not used	
C2	Capacitor, Disc. Cer., .001 UF, 250 V	0286260000
C3	Capacitor, Disc Cer., .01 UF, 25 V	0281620008
C4	Capacitor, Disc. Cer., .001 UF, 250 V	0286260000
C5	Not	
C6	Capacitor, .02 UF, 25 V, Y5 U	0269130004
C7	Capacitor, .02 UF, 25 V, Y5 U	0269130004
C8	Capacitor, Tantalum, 68 UF, 25 V	0282150005
C9	Not used	
C10	Not used	
C11	Not used	
C12	Capacitor, Tantalum, 68 UF, 25 V	0282150005
C13	Not	
C14	Capacitor, Tantalum, 6.8 UF, 20 V	0296780006
C15	Capacitor, Tantalum, 47 UF, 50 V	0245750002
C16	Capacitor, Monolythic, 0.1 UF, 50 V	0281610002
C17	Capacitor, Monolythic, 0.1 UF, 50 V	0281610002
C18	Capacitor, Tantalum, 3.3 UF, 35 V	0281680001
C19	Capacitor, Tantalum, 3.3 UF, 35 V	0281680001
C20	Capacitor, Tantalum, 68 UF, 20 V	0296780006
C21	Capacitor, Tantalum, 68 UF, 20 V	0296780006
CR1	Diode, 1N4004	0405180004
CR2	Diode, 1N4004	0405180004
CR3	Diode, Zener	0405220006
CR4	Diode, Zener, 1N5364B	0405230001
CR5	Diode, Signal, 1N4454	0405270003
CR6	Diode, Signal, 1N4454	0405270003
CR7	Diode, Zener, 1N5245B	0405210001
CR8	Diode, 1N5235B	0405200005
CR9	Diode, Zener, 1N5343B	1003060005
CR10	Diode, Zener, 1N746	0402320000
F2	Fuse, 3 Amp, 250 V	1002550009
F3	Fuse, 3 Amp, 250 V	1002550009
Q2	Translation, PNP, Silicone	0448200007
Q3	Diode, SCR	0446920002
Q4	Diode, SCR	0446920002
Q5	Transistor, PNP, Silicone, 2N4249	0446780006
Q6	Diode, SCR	0447070002
Q7	Transistor, PNP, SI 2N4919	0445370009
Q8	Transistor, PNP, SI2N4919	0445370009
Q9	Transistor, PNP, SI 2N4249	0446780006
Q10	Transistor, PNP, SI 2N4249	0446780006
R1	Resistor, Carbon, 6.8K, 10%, 1/2W	0162290004
R2	Resistor, Carbon, 22 ohm, 10%, 1/2W	0186930003
R3	Resistor, Carbon, 100 ohm, 5%, 1/4W	0171180003
R4	Resistor, Carbon, 1K, 10%, 1/4W	0171560001
R5	Resistor, Carbon, 100 ohm, 5%, 1/4W	0171180003
R6	Resistor, 22 ohm, 5%, 2W	0193620006
R7	Not used	
R8	Resistor, 4750, 1%, 1/8W	1003050018
R9	Resistor, 1K, 10%, 1/4W	0171560001
R10	Resistor, 4.3K, 5%, 1/4W	1005090025
R11	Resistor, 3320, 1%, 1/8W	1003050000
R12	Resistor, Carbon, 4750 ohm, 1%, 1/8W	1003050018
R13	Resistor, Carbon, 100 ohm, 5%, 1/4W	0171180003
R14	Resistor, 0.22 ohm, 5%, 2W	0193620006
R15	Resistor, Carbon, 1K, 10%, 1/4W	0171560001
R16	Resistor, Carbon, 1K, 10%, 1/4W	0171560001
R17	Resistor, 10K, 1%, 1/8W	1003050026
R18	Resistor, Carbon, 470 ohm, 5%, 1/4W	0184110009
R19	Resistor, Carbon, 1K, 10%, 1/4W	0171560001
R20	Resistor, 220, 10%, 1/2W	0172850002
R21	Resistor, 1K, 10%, 1/2W	0167480006
R22	Resistor, 3.9K, 10%, 1/4W	0178830003
R23	Resistor, 120, 10%, 1/2W	0186430001
R24	Resistor, 220, 10%, 1/2W	0172850002
R25	Not used	
R26	Not used	
R27	Resistor, 10K, 10%, 1/4W	0170410005
R28	Resistor, 3.3K, 10%, 1/4W	0170890007
R29	Resistor, 1K, 10%, 1/4W	0171560001
R30	Resistor, 3.3K, 10%, 1/4W	0170890007
R31	Resistor, 560, 10%, 1/2W	0185900003
R32	Pot., 1K, 10%, 1/2W, PC Mount	1004680007
U1	Diode Bridge, MDA970-1	0405260008
U2	Integrated Circuit, Linear, UA723	0448190001
U3	Diode, Bridge, MDA970-1	0405260008
U5	Integrated Circuit, Linear, UA723	0448190001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A6 C1	Capacitor, 0.001 UF, 500 V, 10%	0289350000
1A6 C2	Capacitor, 0.001 UF, 500 V, 10%	0289350000
1A6 C3	Capacitor, 0.001 UF, 500 V, 10%	0289350000
1A6 C4	Capacitor, 0.001 UF, 500 V, 10%	0289350000
1A6 C5	Capacitor, 5000 UF, 50 V	0282140000
1A6 CR1	Barrier Jumper, 140 Series	0508340004
1A6 CR2	Barrier Jumper, 140 Series	0508340004
1A6 CR3	Barrier Jumper, 140 Series	0508340004
1A6 CR4	Barrier Jumper, 140 Series	0508340004
C5	Capacitor, 5500 UF, 40 V	0280930003
C6	Capacitor, 3.3 UF, 35 V	0281680001
C9	Capacitor, 5500 UF, 40 V	0280930003
CR1	Diode, Rectifier, 1N1184R	0405590008
CR2	Diode, Rectifier, 1N1184R	0405590008
CR3	Diode, Rectifier, 1N1184R	0405590008
CR4	Diode, Rectifier, 1N1184R	0405590008
Q102	Transistor, NPN, Si. 2N5877	1001240006
Q103	Transistor, NPN, Si. 2N5877	1001240006
Q104	Diode, SCR 2N6167	0405450001
R1	Resistor, 1K, 5%, 3W	0162790007
R2	Resistor, 0.1, 10%, 15W	0193360004
T1	Transformer, Power	5024020308
	Miscellaneous Mechanical Parts	
Q101	Transistor Power	0448210002
TB2	Barrier Strip, 9 Pos. 6-32	0508030005
	Connector, Power, 11 Pin Rect.	0753320002
	Connector, PC, 30 Pin Female	0753780002
	Socket, Transistor	0766190005
	Fuse, AGC, 15 Amp, 32 V	0848740009


REGULATOR BOARD
FOUR LARGE SCREWS (2 CAPACITORS C5 AND C9 UNDER BOARD)
REGULATOR BOARD HOLD DOWN SCREWS (2 REQ'D.)
FORWARD AND UP
REAR OF CHASSIS
RIGHT SIDE PANEL
COVER CLAMPS (TYP) (LOCATION AND SIZE INDICATED BY PHANTOM BOXES ONLY)



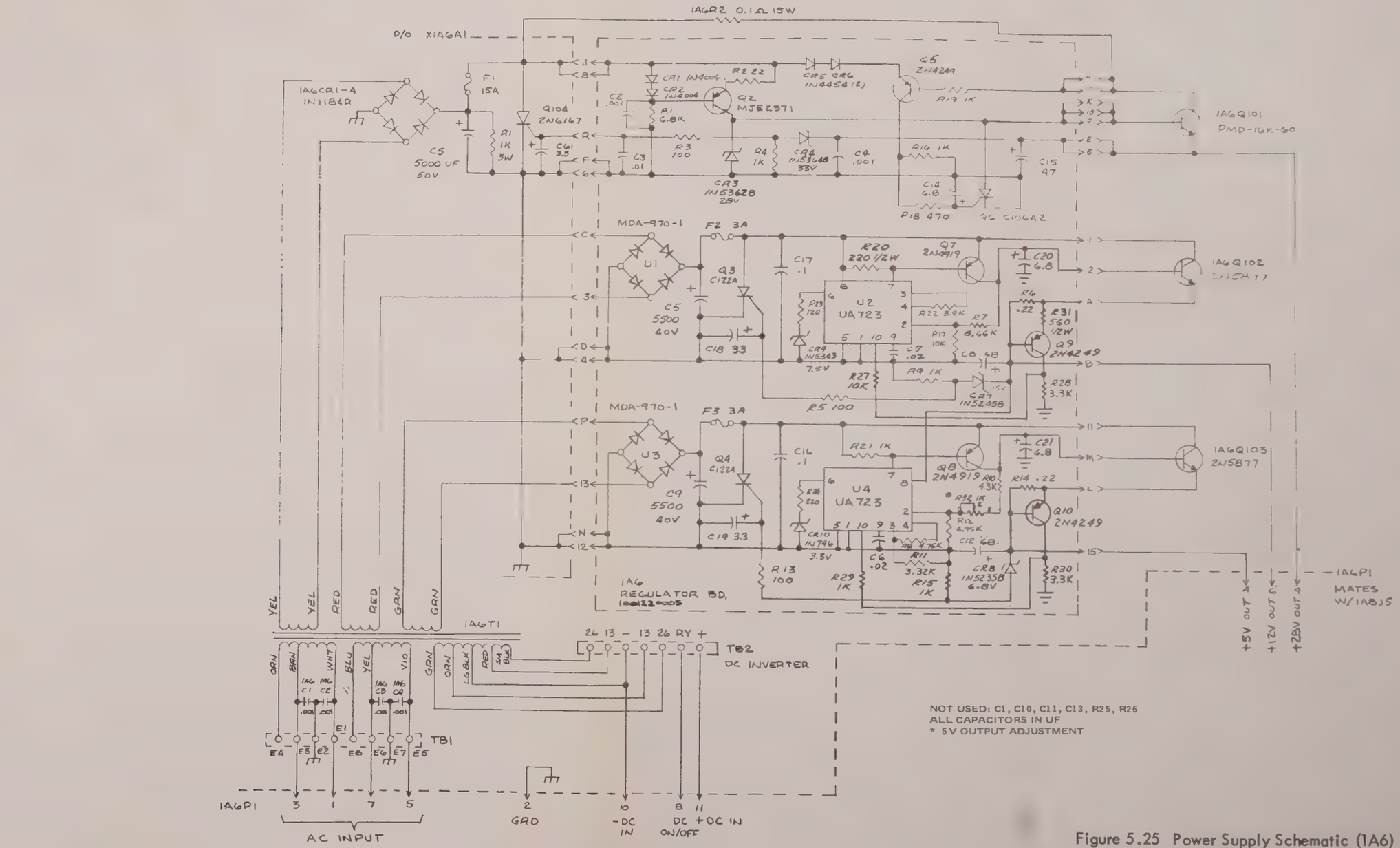


Figure 5.25 Power Supply Schematic (1A6)

1001220005F PC ASS'Y REGULATOR

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C2	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C3	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C4	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C6	Capacitor, 0.02 UF, 25 V, Y5 U	0261930004
C7	Capacitor, 0.02 UF, 25 V, YSU	0261930004
C8	Capacitor, 68 UF, 25 V, T368	0282150005
C12	Capacitor, 68 UF, 25 V, T368	0282150005
C14	Capacitor, 6.8 UF, 20 V, T368	0296780006
C15	Capacitor, 47 UF, 50 V, CL658	0245750002
C16	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C17	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C18	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C19	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C20	Capacitor, 6.8 UF, 20 V, T368	0296780006
C21	Capacitor, 6.8 UF, 20 V, T368	0296780006
CR1	Diode, Rectifier, 1 N4004	0405180004
CR2	Diode, Rectifier, 1 N4004	0405180004
CR3	Diode, Zener	0405220006
CR4	Diode, Zener, 1 N5364 B	0405230001
CR5	Diode, Signal, Sil, 1 N4454	0405270003
CR6	Diode, Signal, Sil, 1 N4454	0405270003
CR7	Diode, Zener, 1 N5254 B	0405210001
CR8	Diode, Zener, 1 N5235 B	0405200005
CR9	Diode, Zener, 1 N5343 B	1003060005
CR10	Diode, Zener, 1 N746	0402320000
F2	Fuse, AGC, 3 Amp, 250 V	1002550009
F3	Fuse, AGC, 3 Amp, 250 V	1002550009
Q2	Transistor, PNP, Sil, TIP-32 A	0448200007
Q3	Diode, SCR, C122 A	0446920002
Q4	Diode, SCR, C122 A	0446920002
Q5	Transistor, PNP, Si, 2 N4249	0466780006
Q6	Diode, SCR, C106 A2	0447070002
Q7	Transistor, PNP, Si., 2 N4919	0445370009
Q8	Transistor, PNP, Si., 2 N4919	0445370009
Q9	Transistor, PNP, Si, 2 N4249	0466780006
Q10	Transistor, PNP, Si., 2 N4249	0466780006
R1	Resistor, 6.8 K, 10%, 1/2 W	0162290004
R2	Resistor, 22, 10%, 1/2 W	0186930003
R3	Resistor, 100, 5%, 1/4 W	0171180003
R4	Resistor, 1 K, 10%, 1/4 W	0171560001
R5	Resistor, 100, 5%, 1/4 W	0171180003
R6	Resistor, 0.22, 5%, 2 W	0193620006
R7	Resistor, 8.66 K, 1%, 1/8 W	1003120008
R8	Resistor, 4750, 1%, 1/8 W	1003050018
R9	Resistor, 1 K, 10%, 1/4 W	0171560001
R10	Resistor, 4.3 R, 5%, 1/4 W	1005090025
R11	Resistor, 3320, 1%, 1/8 W	1003050000
R12	Resistor, 4750, 1%, 1/8 W	1003050018
R13	Resistor, 100, 5%, 1/4 W	0171180003
R14	Resistor, 0.22, 5%, 2 W	0193620006
R15	Resistor, 1 K, 10%, 1/4 W	0171560001
R16	Resistor, 1 K, 10%, 1/4 W	0171560001
R17	Resistor, 10 K, 1%, 1/8 W	1003050026
R18	Resistor, 470 K, 5%, 1/4 W	0184110009
R19	Resistor, 1 K, 10%, 1/4 W	0171560001
R20	Resistor, 220, 10%, 1/2 W	0172850002
R21	Resistor, 1 K, 10%, 1/2 W	0164780006
R22	Resistor, 3.9 K, 10%, 1/4 W	0718830003
R23	Resistor, 120, 10%, 1/2 W	0186430001
R24	Resistor, 220, 10%, 1/2 W	0172850002
R27	Resistor, 10 K, 10%, 1/4 W	0170410005
R28	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R29	Resistor, 1 K, 10%, 1/4 W	0171560001
R30	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R31	Resistor, 560, 10%, 1/2 W	0185900003
R32	Potentiometer, 1 K, 1/2 W	1004680007
U1	Diode, Bridge, MDA-970-1	0405260008
U2	IC Linear, VA723	0448190001
U3	Diode, Bridge, MDA-970-1	0405260008
U4	IC Linear, VA723	0448190001

5024020090R PWR SUPPLY ASS'Y

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1 A6 C1	Capacitor, 0.001 UF, 500 V, X5 F, 10%	0289350000
1 A6 C2	Capacitor, 0.001 UF, 500 V, X5 S, 10%	0289350000
1 A6 C3	Capacitor, 0.001 UF, 500 V, X5 S, 10%	0289350000
1 A6 C4	Capacitor, 0.001 UF, 500 V, X5 S, 10%	0289350000
1 A6 C5	Capacitor, 5000 UF, 50 V	0282140000
C5	Capacitor, 5500 UF, 40 V	0280930003
C9	Capacitor, 5500 UF, 40 V	0280930003
F1	Fuse, AGC, 15 Amp, 32 V	0848740009
J1	Connector, PC, 30 Pin Female	0753780003
P1	Connector, Power, 11 Pin Rect.	0753320002
Q104	Diode, Scr., 2 N6167	0405450001
R1	Resistor, 1 K, 5%, 3 W	0162790007
R2	Resistor, 0.1, 10%, 15 W	0193360004
T1	Transformer, Power	5024020308
	Miscellaneous Mechanical Parts	
	Standoff, M-F, 4-40, .750 L	0508010004
	Diode, Rect. W/Hdw 1 N1184 R	0405590008
	Insulator	0841560005
	Socket, Transistor	0766190005
	Fusemount, 1 Pole W/Terminals	0842490001
	Socket, Xsistor, TO-3 Hi-Pwr	1000130029
	Transistor, NPN, Si. 2 N5877	1001240006

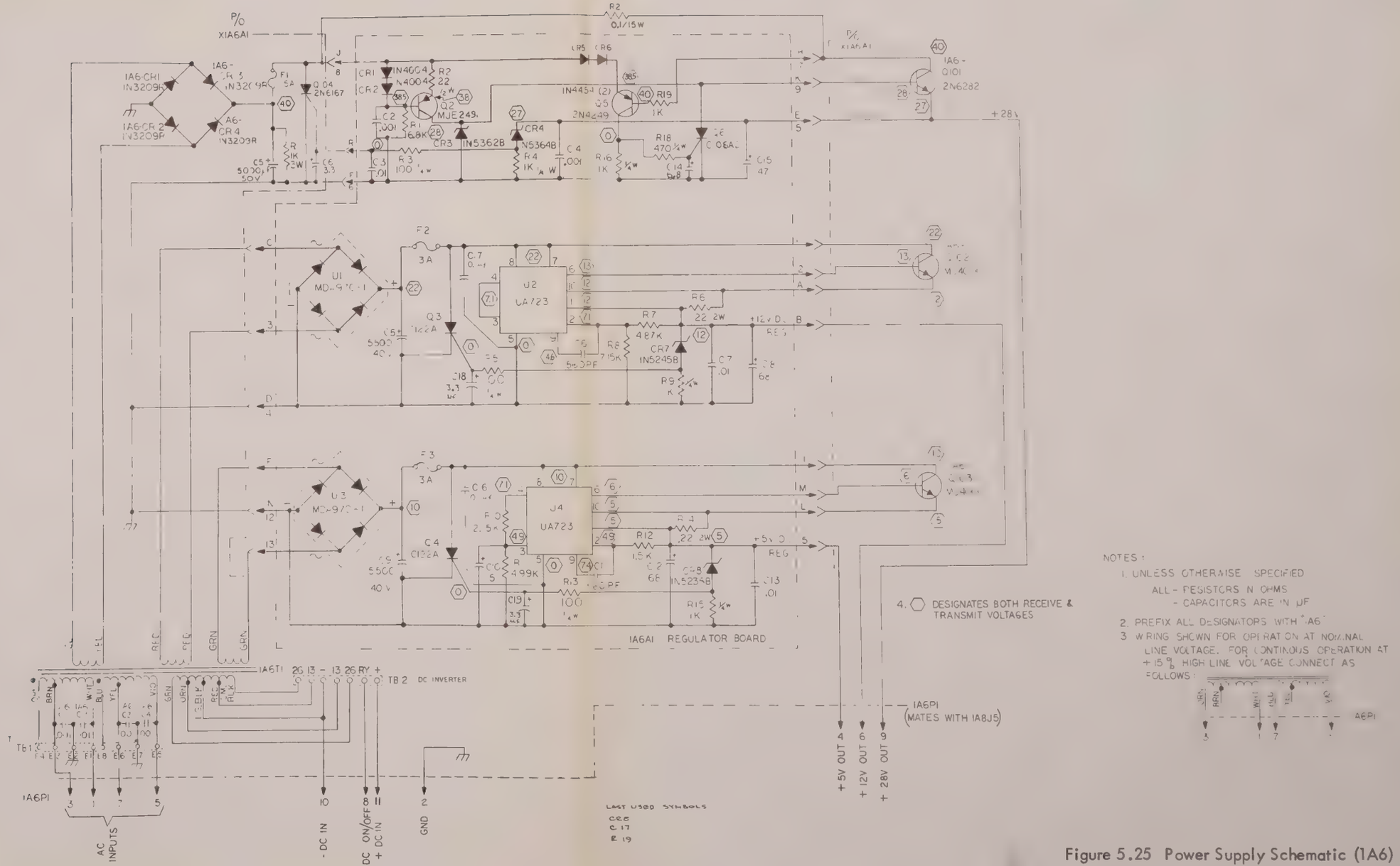
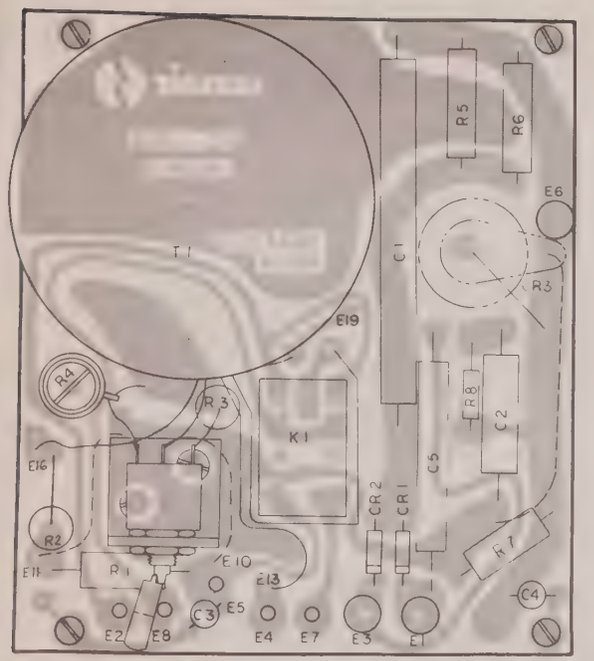


Figure 5.25 Power Supply Schematic (1A6)

5024020596M REGULATOR BOARD ASSY.

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	REGULATOR BOARD ASSY	5024020596
C1	Not used	
C2	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C3	Capacitor, 0.01 UF, 25 V, X5 R	0281620008
C4	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C5	Not used	
C6	Capacitor, 560 PF, 300 V, DM15, 5%	0283750006
C7	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C8	Capacitor, 68 UF, 25 V, T368	0282150005
C9	Not used	
C10	Capacitor, 15 UF, 15 V, 196 D	0281720002
C11	Capacitor, 560 PF, 300 V, DM15, 5%	0283750006
C12	Capacitor, 68 UF, 25 V, T368	0282150005
C13	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C14	Capacitor, 6.8 UF, 20 V, T368	0296780005
C15	Capacitor, 47 UF, 50 V, CL65 B	0245750002
C16	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C17	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C18	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C19	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
CR1	Diode, Rectifier 1N4004	0405180004
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Zener	0405220006
CR4	Diode, Zener 1N5364 B	0405230001
CR5	Diode, Signal, Sil. 1N4454	0405270003
CR6	Diode, Signal, Sil. 1N4454	0405270003
CR7	Diode, Zener 1N5245 B	0405210001
CR8	Diode, Zener 1N5235 B	0405200005
F1	Not used	
F2	Fuse, AGC, 3 Amp, 250 V	1002550009
F3	Fuse, AGC, 3 Amp, 250 V	1002550009
Q1	Not used	
Q2	Transistor, PNP, Sil. TIP-32 A	0448200007
Q3	Diode, SCR C122 A	0446920002
Q4	Diode, SCR C122 A	0446920002
Q5	Transistor, PNP, Si. 2N4249	0446780006
Q6	Diode, SCR C106 A2	0447070002
R1	Resistor, 5.8 K, 10%, 1/2 W	0162290004
R2	Resistor, 22, 10%, 1/2 W	0186930003
R3	Resistor, 100, 5%, 1/4 W	0171180003
R4	Resistor, 1 K, 10%, 1/4 W	0171560001
R5	Resistor, 100, 5%, 1/4 W	0171180003
R6	Resistor, 0.22, 5%, 2 W	0193620006
R7	Resistor, 4870, 1%, 1/2 W	0193740001
R8	Resistor, 7150, 1%, 1/2 W	0193860007
R9	Resistor, 1 K, 10%, 1/4 W	0171560001
R10	Resistor, 2150, 1%, 1/2 W	0193480000
R11	Resistor, 4990, 1%, 1/2 W	0193500001
R12	Resistor, 1.5 K, 10%, 1/2 W	0177300001
R13	Resistor, 100, 5%, 1/4 W	0171180003
R14	Resistor, 0.22, 5%, 2 W	0193620006
R15	Resistor, 1 K, 10%, 1/4 W	0171560001
R16	Resistor, 1 K, 10%, 1/4 W	0171560001
R17	Not used	
R18	Resistor, 470, 5%, 1/4 W	0184110009
R19	Resistor, 1 K, 10%, 1/4 W	0171560001
U1	Diode, Bridge, MDA970-1	0405260008
U2	IC Linear VA723	0448190001
U3	Diode, Bridge MDA970-1	0405260008
U4	IC Linear VA723	0448190001

S5024021371G



5024021495S PC ASSY DC INV. W/HEAT SINK OP

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY DC INV. W/HEAT SINK OP	5024021495
C1	Capacitor, 12 UF, 100 V	0282020004
C2	Capacitor, 1 UF, 100 V, Mylar	0272300004
C3	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C4	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C5	Capacitor, 1 UF, 200 V, Mylar	0245250000
CR1	Diode, Rectifier 1 N4004	0405180004
CR2	Diode, Rectifier 1 N4004	0405180004
CR3	Diode, Rectifier 1 N3209 R	0405190000
K1	Relay, DPDT, 12 V	1000190030
Q1	Transistor, PNP, GE. 2 N5439	0448320002
Q2	Transistor, PNP, GE. 2 N5439	0448320002
R1	Resistor, 470, 10%, 2W	0163580006
R2	Resistor, 470, 10%, 2W	0163580006
R3	Resistor, 0.47, 5%, 2W	0197350003
R4	Resistor, 0.1, 10%, 12W	0197490000
R5	Resistor, 3.3 K, 10% 2W	0197220002
R6	Resistor, 3.3 K, 10%, 2W	0197220002
R7	Resistor, 27, 10%, 1W	0197150004
R8	Resistor, 1.2, 10%, 1/2W	0188490001
S1	Switch, Toggle, DPDT	0346370001
T1	Transformer, Saturable	5024021509
	Mica Ins. TO-3 Transistor Mount, Transistor	0440940001
	Thermal Compound	0502740001
	Standoff, M-F, 4-40 .250 L	0840810008
	Heat Sink, DC Inverter	1003170005
		5024021100

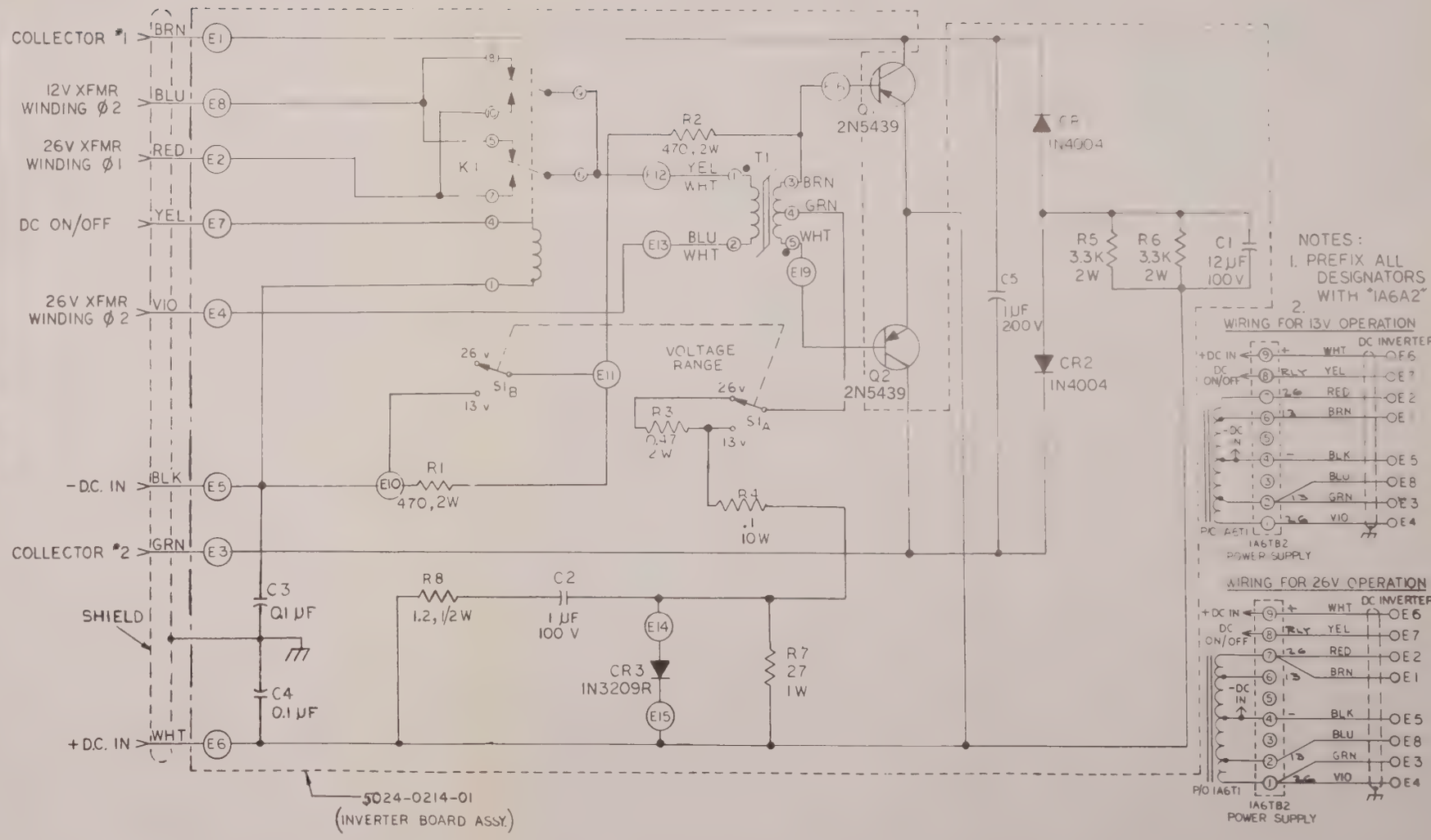


Figure 5.26 D.C. Inverter Schematic (1A6A2)

5024052994AE PC ASSY MOTOR CONTROL

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY. MOTOR CONTROL	5024052994
B1	Motor, 12 VDC, 96.7/1 Gear/Red	5024053508
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 1 UF, 50 V, 198 D	0280910002
C3	Capacitor, 1 UF, 50 V, 198 D	0280910002
C4	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C5	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C6	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C7	Capacitor, 1 PF, 500 V, DM10	0260160008
C8	Not used	
C9	Not used	
C10	Not used	
C11	Not used	
C12	Not used	
C13	Capacitor, 5-20 PF, 100 V, Ceramic	0282930001
C14	Not used	
C15	Not used	
C16	Not used	
C17	Not used	
C18	Not used	
C19	Not used	
C20	Capacitor, 1 PF, 500 V, DM10	0260160008
C21	Capacitor, 2-8 PF, 350 V, NPO	0268220000
C22	Capacitor, 120 PF, 500 V, DM15, 5%	0289850002
C23	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C24	Capacitor, 5-20 PF, 100 V, Ceramic	0282930001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C25	Capacitor, 150 PF, 500 V, DM15, 5%	0274980002
C26	Not used	
C27	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C28	Capacitor, 47 UF, 20 V, 196 D	0281700001
CR1	Not used	
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Rectifier 1N4004	0405180004
CR4	Diode, Rectifier 1N4004	0405180004
CR5	Diode, Signal, Sil. 1N4454	0405270003
CR6	Diode, Signal, Sil. 1N4454	0405270003
CR7	Not used	
CR8	Not used	
CR9	Not used	
CR10	Not used	
CR11	Not used	
CR12	Diode, Signal, Sil., 1N4454	0405270003
CR13	Not used	
CR14	Not used	
CR15	Not used	
CR16	Diode, Signal, Sil. 1N3064	0405460007
CR17	Diode, Signal, Sil. 1N4454	0405270003
J1	Connector, Power, 20 Pin Rect.	0753470004
J2	Connector, RF, BNC	0753490005
J3	Connector, RF, JCM	0753600005
J4	Connector, RF, BNC	0754390005

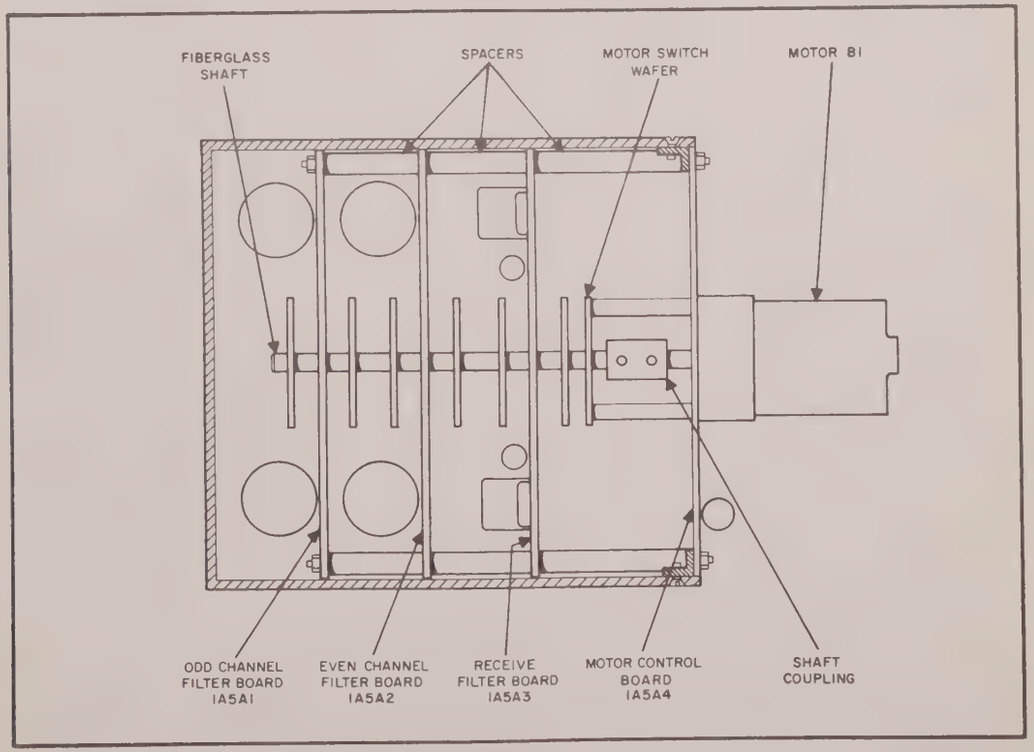
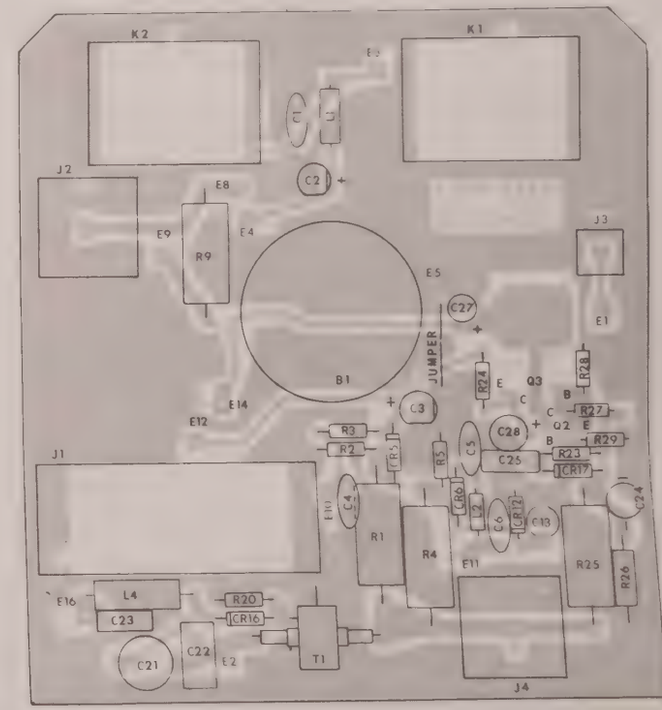


Figure 5.27 Filter Module Assembly

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
L1	Inductor, Molded, 47 UH, 5%	0646420003
L2	Inductor, Molded, 22 UH, 5%	0650000005
L3	Not used	
L4	Inductor, Molded, 2000 UH, 5%	0653590008
Q1	Not used	
Q2	Transistor, NPN, Si. MPSU45	0448570009
Q3	Transistor, NPN, Si. MJE2801	0448530007
R1	Resistor, 4.7 K, 10%, 2 W	0164130004
R2	Resistor, 1 K, 10%, 1/4 W	0171560001
R3	Resistor, 12 K, 10%, 1/4 W	0183180003
R4	Resistor, 2.7 K, 5%, 2 W	0195940008
R5	Resistor, 680, 10%, 1/4 W	0176630007
R6	Not used	
R7	Not used	
R8	Not used	
R9	Resistor, 56, 10%, 2 W	0197210007
R10	Not used	
R11	Not used	
R12	Not used	
R13	Not used	
R14	Not used	

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R15	Not used	
R16	Not used	
R17	Not used	
R18	Not used	
R19	Not used	
R20	Not used	
R21	Not used	
R22	Not used	
R23	Resistor, 1 K, 10%, 1/4 W	0171560001
R24	Resistor, 27 K, 10%, 1/4 W	0171200004
R25	Resistor, 2.7 K, 5%, 2 W	0195940008
R26	Resistor, 390, 10%, 1/2 W	0173260004
R27	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R28	Resistor, 1 M, 10%, 1/4 W	0170650006
R29	Resistor, 56 K, 10%, 1/4 W	0171440005
S1	Switch, Wafer, Motor Control	5024053109
T1	Transformer, Current	5024055608
	Socket, Relay, 4 PDT CONTACTS	0767000005
	Retainer, Relay Socket	0767500008
	PC Assy. Band Pulse Suppressor	1004170092
	Coupling, Flex. 3/16 - 1/4 ID	0346360005



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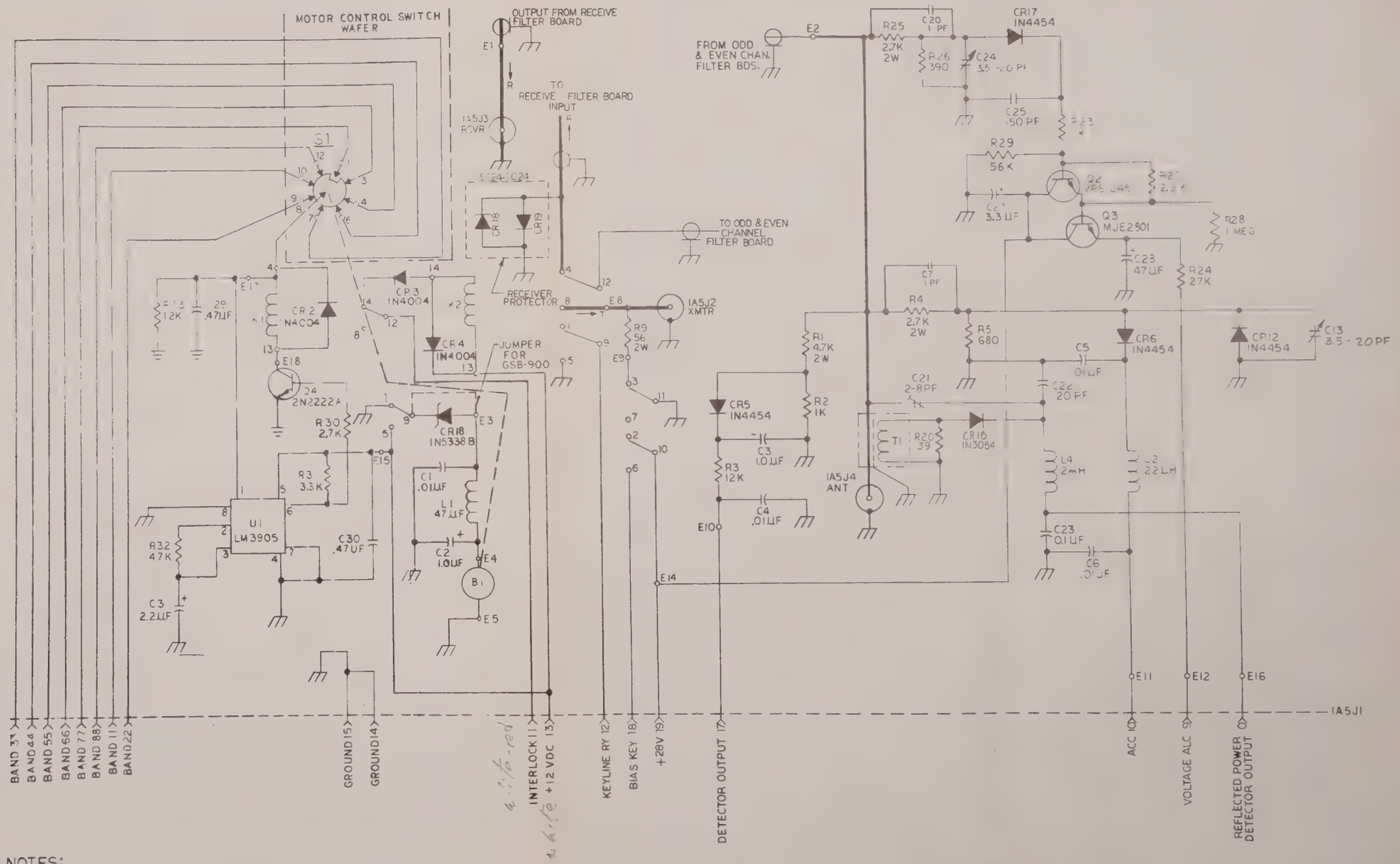


NOTES:

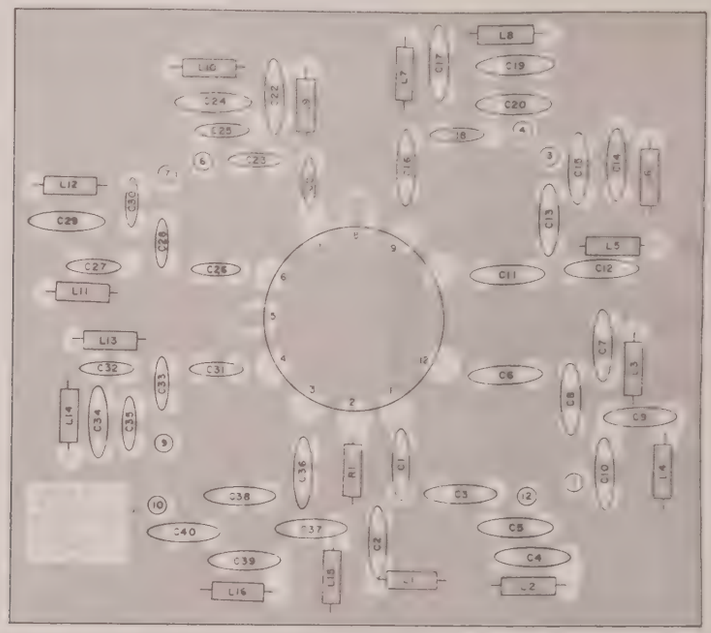
1.) UNLESS OTHERWISE SPECIFIED:
ALL RESISTORS ARE IN OHMS AND 1/4 WATT.
INDUCTANCE VALUES ARE IN MICROHENIES.
PREFIX ALL ITEMS WITH 1A5A4.

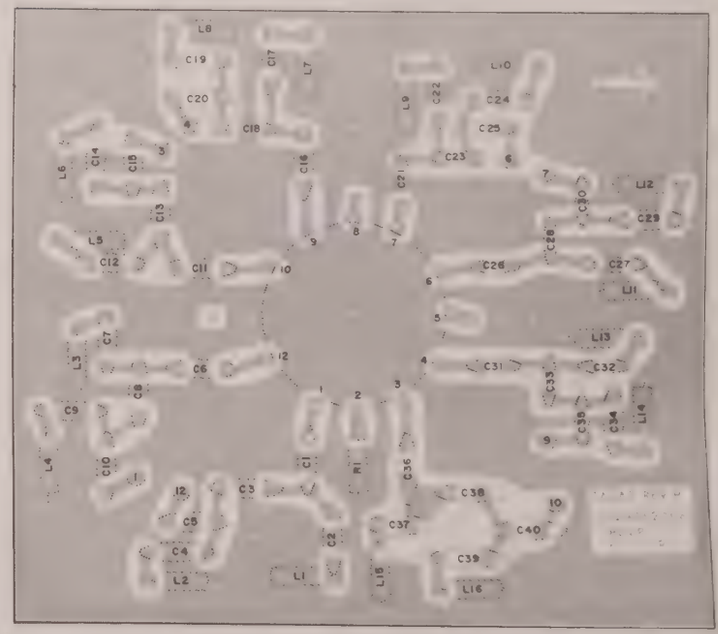
* CR18 USED ONLY IN GSE 924

Figure 5.28 Motor Control Board Schematic (1A5A4)

5024052692 PC ASSY RECEIVE FLTR. GSB-900

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY RECEIVE FLTR. GSB-900	5024052692
C1	Capacitor, 2700 PF, 500 V, DM19, 2%	0281240001
C2	Capacitor, 4700 PF, 500 V, DM19, 2%	0281390002
C3	Capacitor, 1300 PF, 500 V, DM19, 2%	0281380007
C4	Capacitor, 11000 PF, 500 V, DM30, 2%	0281370001
C5	Capacitor, 2200 PF, 500 V, DM19, 2%	0281360006
C6	Capacitor, 220 oPF, 500 V, DM19, 2%	0281360006
C7	Capacitor, 3300 PF, 500 V, DM19, 2%	0281250006
C8	Capacitor, 1100 PF, 500 V, DM19, 2%	0281000000
C9	Capacitor, 9100 PF, 500 V, DM30, 2%	0280960000
C10	Capacitor, 1600 PF, 500 V, DM19, 2%	0281220000
C11	Capacitor, 1500 PF, 500 V, DM19, 2%	0281270007
C12	Capacitor, 2200 PF, 500 V, DM19, 2%	0281360006
C13	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006
C14	Capacitor, 5600 PF, 500 V, DM20, 2%	0281260001
C15	Capacitor, 1100 PF, 500 V, DM19, 2%	0281000000
C16	Capacitor, 1100 PF, 500 V, DM19, 2%	0281000000
C17	Capacitor, 1800 PF, 500 V, DM19, 2%	0281300003
C18	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002
C19	Capacitor, 4700 PF, 500 V, DM19, 2%	0281390002
C20	Capacitor, 820 PF, 500 V, DM19, 2%	0281280002
C21	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006
C22	Capacitor, 1200 PF, 500 V, DM19, 2%	0281030006
C23	Capacitor, 360 PF, 500 V, DM15, 2%	0281160007
C24	Capacitor, 3000 PF, 500 V, DM19, 2%	0281320004
C25	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002
C26	Capacitor, 510 PF, 500 V, DM15, 2%	0281230005
C27	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006
C28	Capacitor, 220 PF, 500 V, DM15, 2%	0281420009
C29	Capacitor, 2000 PF, 500 V, DM19, 2%	0281410003
C30	Capacitor, 390 PF, 500 V, DM15, 2%	0281040001
C31	Capacitor, 360 PF, 500 V, DM15, 2%	0281160007
C32	Capacitor, 470 PF, 500 V, DM15, 2%	0281440000
C33	Capacitor, 160 PF, 500 V, DM15, 2%	0281340005
C34	Capacitor, 1500 PF, 500 V, DM19, 2%	0281270007
C35	Capacitor, 270 PF, 500 V, DM15, 2%	0280970005
C36	Capacitor, 220 PF, 500 V, DM15, 2%	0281420009
C37	Capacitor, 330 PF, 500 V, DM15, 2%	0281070008
C38	Capacitor, 110 PF, 500 V, DM15, 2%	0281460001
C39	Capacitor, 910 PF, 500 V, DM19, 2%	0281450005
C40	Capacitor, 160 PF, 500 V, DM15, 2%	0281340005
L1	Inductor, Molded, 5.6 UH, 5%	0650360001
L2	Inductor, Molded, 4.7 UH, 5%	0651910005
L3	Inductor, Molded, 4.7 UH, 5%	0651910005
L4	Inductor, Molded, 3.9 UH, 5%	0650480007
L5	Inductor, Molded, 3.3 UH, 5%	0658920006
L6	Inductor, Molded, 2.7 UH, 5%	0652180001
L7	Inductor, Molded, 2.2 UH, 5%	0649890001
L8	Inductor, Molded, 1.8 UH, 5%	0652440002
L9	Inductor, Molded, 1.5 UH, 5%	0649270002
L10	Inductor, Molded, 1.2 UH, 5%	0649910001
L11	Inductor, Molded, 1.0 UH, 5%	0649150007
L12	Inductor, Molded, 0.82 UH, 5%	0652320007
L13	Inductor, Molded, 0.82 UH, 5%	0652320007
L14	Inductor, Molded, 0.56 UH, 5%	0649530004
L15	Inductor, Molded, 0.47 UH, 5%	0649410009
L16	Inductor, Molded, 0.39 UH, 5%	0649770005
R1	Resistor, 10, 10%, 1/2 W	0185380000
S1	Switch, Wafer, Rec. Filt. Top	5024052803
S2	Switch	5024053401





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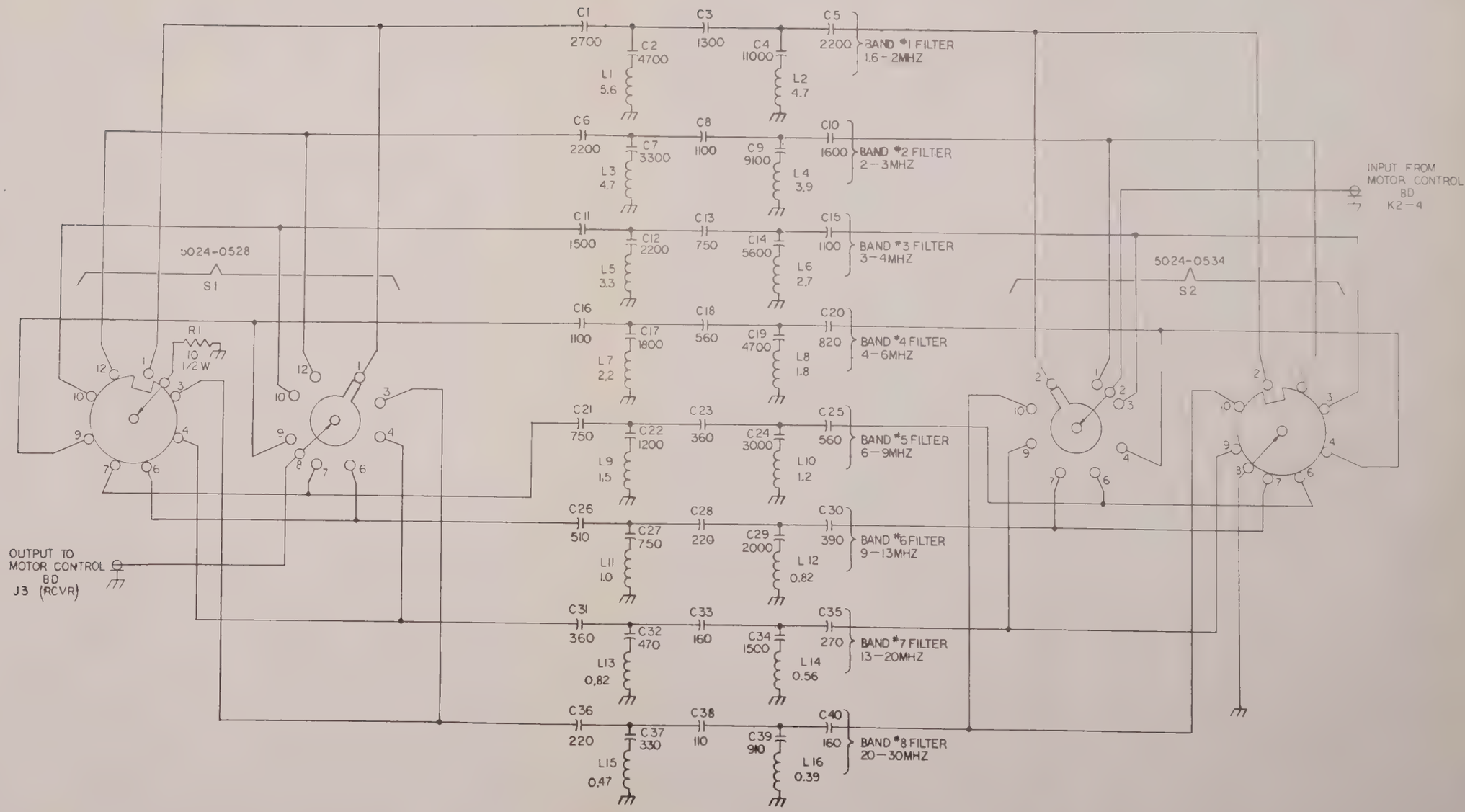
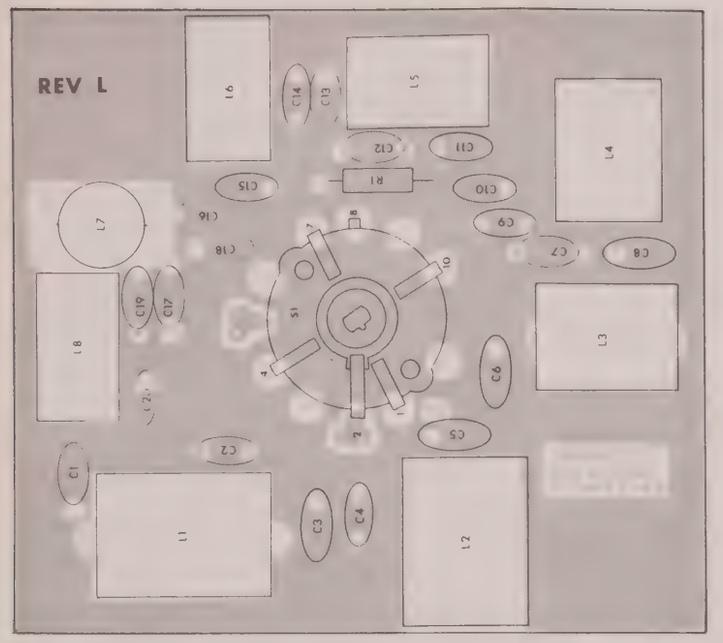
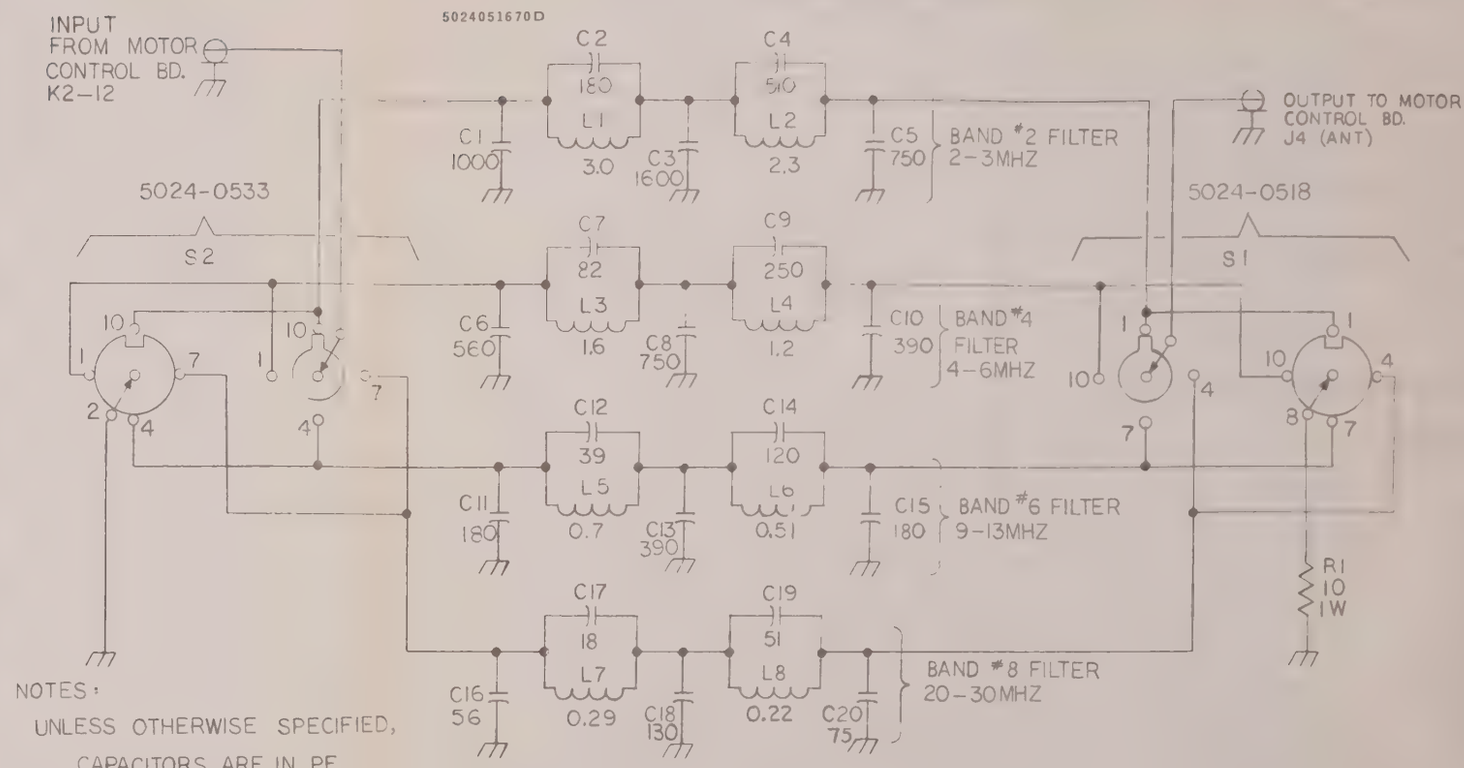


NOTES:
UNLESS OTHERWISE SPECIFIED:
CAPACITORS ARE IN UF.
INDUCTORS ARE IN UH.
PREFIX ALL DESIGNATORS WITH "1A5A3"

Figure 5.29 Receive Filter Board Schematic (1A5A3)





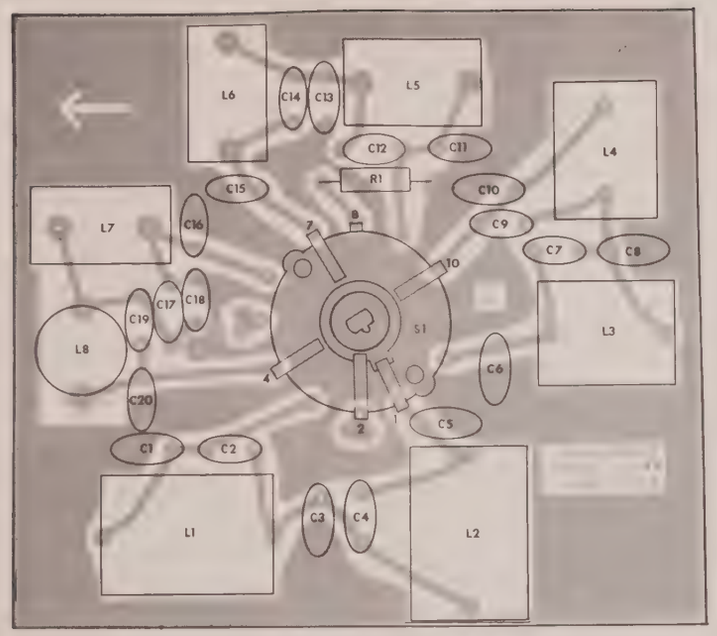
NOTES:
UNLESS OTHERWISE SPECIFIED,
CAPACITORS ARE IN PF
INDUCTORS ARE IN μH.
PREFIX ALL DESIGNATORS
WITH "1A5A2"

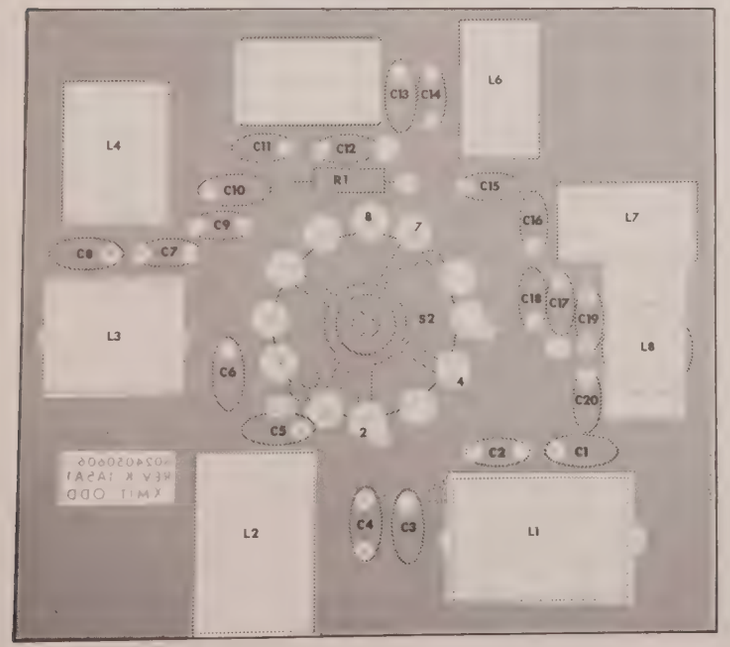
5024051696F PC ASSY EVEN CHANNEL FILTER

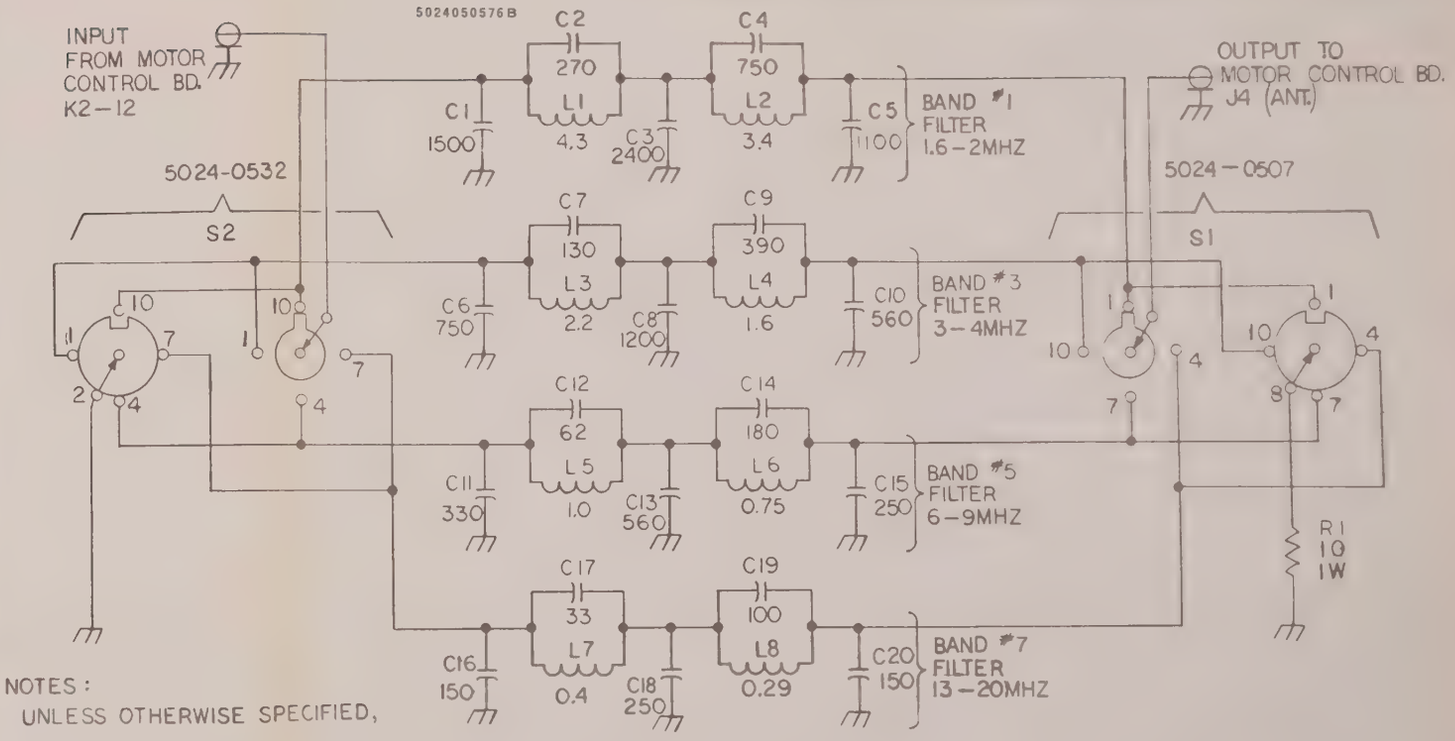
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY EVEN CHANNEL FILTER	5024051696
C1	Capacitor, 1000 PF, 500 V, DM19, 2%	0281210004
C2	Capacitor, 180 PF, 500 V, DM19, 2%	0282700005
C3	Capacitor, 1600 PF, 500 V, DM19, 2%	0281220000
C4	Capacitor, 510 PF, 500 V, DM19, 2%	0282630007
C5	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006
C6	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002
C7	Capacitor, 82 PF, 500 V, DM20, 2%	0282790004
C8	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006
C9	Capacitor, 250 PF, 500 V, DM19, 2%	0282680004
C10	Capacitor, 390 PF, 500 V, DM19, 2%	0282640002
C11	Capacitor, 180 PF, 500 V, DM19, 2%	0282700005
C12	Capacitor, 39 PF, 500 V, DM20, 2%	0282830006
C13	Capacitor, 390 PF, 500 V, CM19, 2%	0282640002
C14	Capacitor, 120 PF, 500 V, DM19, 2%	0282750002
C15	Capacitor, 180 PF, 500 V, DM19, 2%	0282700005

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C16	Capacitor, 51 PF, 500 V, DM20, 2%	0282820001
C17	Capacitor, 18 PF, 500 V, DM20	0282860002
C18	Capacitor, 130 PF, 500 V, DM19, 2%	0282740007
C19	Capacitor, 51 PF, 500 V, DM20	0282820001
C20	Capacitor, 75 PF, 500 V, DM15, 2%	0281110000
L1	Inductor, Filter, 3.10 UH Gry	5024051904
L2	Inductor, Filter, 2.32 UH Wht	5024052006
L3	Inductor, Filter, 1.60 UH Grn	5024051106
L4	Inductor, Filter, 1.20 UH Wh/Red	5024052102
L5	Inductor, Filter, 0.65 UH Wh/Grn	5024052200
L6	Inductor, Filter, 0.51 UH, Wh/Yel	5024052307
L7	Inductor, Filter, 0.275 UH Vio	5024051505
L8	Inductor, Filter, 0.22 UH, Wh/Grn	5024052501
R1	Resistor, 10, 10%, 1W	0196090008
S1	Switch, Wafer, Even Ch. Top	5024051807
S2	Switch, Wafer, Even Ch. Bottom	5024053303

Figure 5.30 Even Channel Filter Schematic (1A5A2)







NOTES :
UNLESS OTHERWISE SPECIFIED,
CAPACITORS ARE IN PF
INDUCTORS ARE IN μH
PREFIX ALL DESIGNATORS WITH "1A5A1."

5024050592C PC ASSY ODD CHANNEL FILTER

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY ODD CHANNEL FILTER	5024050592
C1	Capacitor, 1500 PF, 500 V, DM19, 2%	0281270007
C2	Capacitor, 270 PF, 500 V, DM19, 2%	0282670009
C3	Capacitor, 2400 PF, 500 V, DM19, 2%	0280980001
C4	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006
C5	Capacitor, 1100 PF, 500 V, DM19, 2%	0281000000
C6	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006
C7	Capacitor, 130 PF, 500 V, DM19, 2%	0282740007
C8	Capacitor, 1200 PF, 500 V, DM19, 2%	0281030006
C9	Capacitor, 390 PF, 500 V, DM19, 2%	0282640002
C10	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002
C11	Capacitor, 330 PF, 500 V, DM19, 2%	0282660003
C12	Capacitor, 62 PF, 500 V, DM20, 2%	0282810005
C13	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002
C14	Capacitor, 180 PF, 500 V, DM19, 2%	0282700005
C15	Capacitor, 250 PF, 500 V, DM19, 2%	0282680004

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C16	Capacitor, 150 PF, 500 V, DM19, 2%	0282730001
C17	Capacitor, 33 PF, 500 V, DM20, 2%	0282850007
C18	Capacitor, 250 PF, 500 V, DM19, 2%	0282680004
C19	Capacitor, 100 PF, 500 V, DM19, 2%	0282770009
C20	Capacitor, 150 PF, 500 V, DM19, 2%	0282730001
L1	Inductor, Filter, 4.5 UH Blk	5024050801
L2	Inductor, Filter, 3.4 UH Brn	5024050908
L3	Inductor, Filter, 2.15 UH Red	5024051009
L4	Inductor, Filter, 1.60 UH Orn	5024051106
L5	Inductor, Filter, 1.00 UH Yel	5024051203
L6	Inductor, Filter, 0.73 UH Grn	5024051301
L7	Inductor, Filter, 0.41 UH Blu	5024051408
L8	Inductor, Filter, 0.275 UH Vio	5025051505
R1	Resistor, 10, 10%, 1W	0196090008
S1	Switch, Wafer, Odd Ch Top	5024050703
S2	Switch, Wafer, Odd Ch Top	5024053206

Figure 5.31 Odd Channel Filter Schematic (1A5A1)

SECTION 6
ACCESSORIES

6.1 PHONE PATCH OPTION

The Phone Patch option may be used to transfer information from the telephone lines through the GSB-900SC. The patch is not automatic and must be manually switched between receive and transmit functions. This requires that both conversing parties say "OVER" upon completion of each transmission to enable the radio operator to switch the patch unit.

6.1.1 INSTALLATION

The Phone Patch may be installed on either the left or right hand front panel end plates (See Figure 6.1). The mounting plate is installed first to the end plate (the microphone mounting clip must be relocated if patch is installed on the left side). Then the patch assembly is slid over the four mounting posts and the cover placed over the assembly. The telephone line is connected to the two outside terminals on the terminal strip on the rear apron of the patch. The patch control connector is then plugged into the audio connector, 1A8J2, on the rear panel of the GSB-900 SC.

6.1.2 OPERATION

To operate the patch, turn on the GSB-900SC., then turn the patch power switch up to "ON". The TRANSMIT-RECEIVE switch should be in the center position. The power switch should light "WHITE" and the TRANSMIT-RECEIVE switch should light "RED". The receiver output is now patched to the telephone lines. Adjust the RCV GAIN control on the patch for a comfortable level in the telephone handset (if exceptionally lossy telephone lines are encountered, more receive gain may be obtained by turning 1A3A4 R48 on the GSB-900SC Audio Board clockwise 5 or 6 turns).

To transmit from the phone lines through the GSB-900SC, move the TRANSMIT-RECEIVE switch up to "TRANSMIT" position. The switch should now show a "RED" color and the transceiver should be keyed. Adjust the XMIT GAIN control clockwise until the GSB-900SC front panel meter (switch in FWD position) shows no further increase, indicating ALC has been reached. (If exceptionally lossy telephone lines are encountered, additional transmit gain may be obtained by turning 1A3A4 R58 on the GSB-900SC Audio Board, clockwise ten turns).

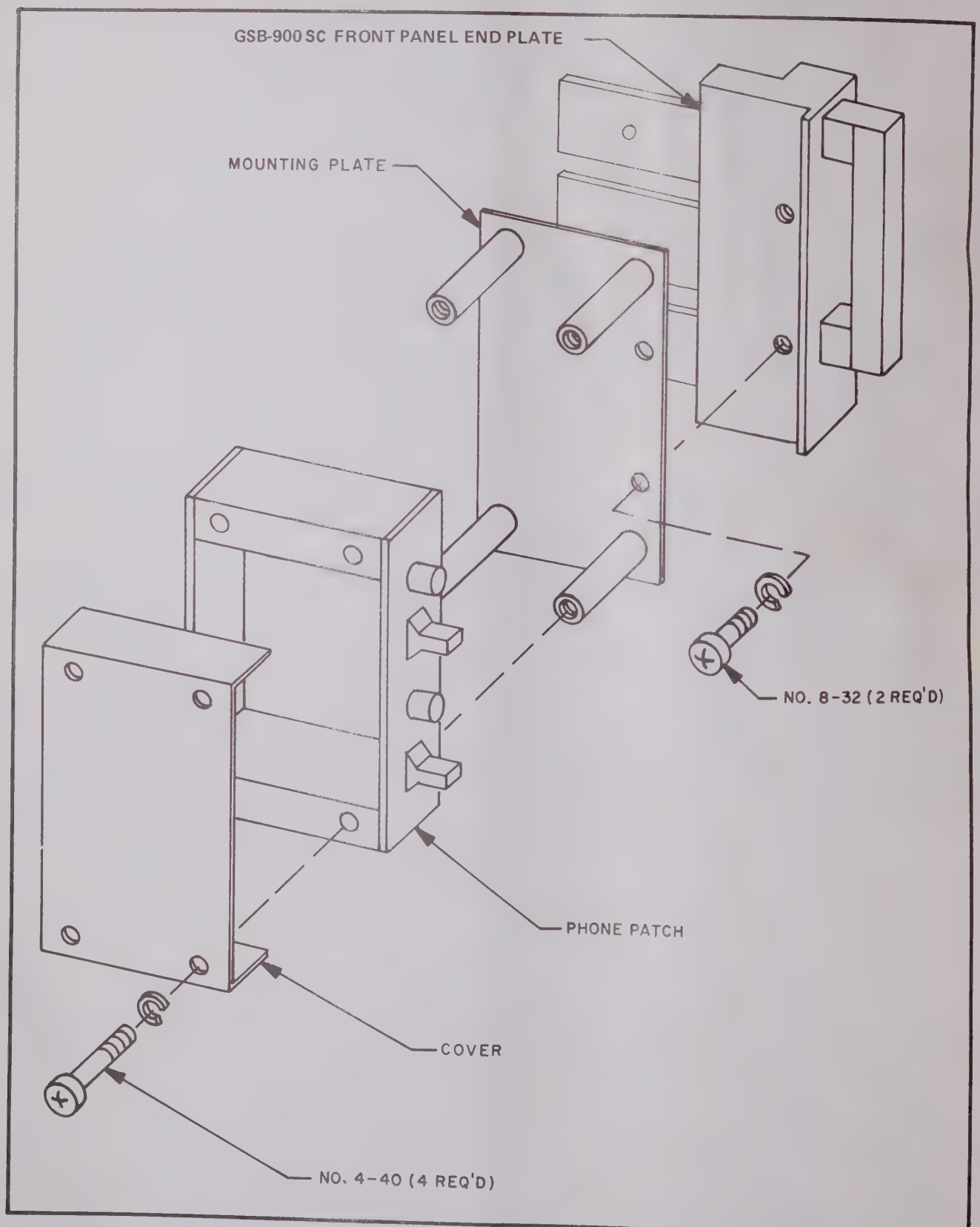


Figure 6.1 GSB-900SC Phone Patch Mounting Instructions

5024400097G PC ASSY/CHAS, PHONE PATCH

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY/CHAS, PHONE PATCH	50244000xx
C1	Capacitor, 15 UF, 20 V, 198 D	0280920008
C2	Capacitor, 68 UF, 15 V, T368	0296540005
C3	Capacitor, 1 UF, 50 V, 198 D	0280910002
C4	Capacitor, 68 UF, 15 V, T368	0296540005
C5	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C6	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C7	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C8	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C9	Capacitor, 3 UF, 200 V, Mylar	0278520006
C10	Capacitor, 3 UF, 200 V, Mylar	0278520006
L1	Inductor, Molded, 2000 UH, 5%	0653590008
L2	Inductor, Molded, 2000 UH, 5%	0653590008
P1	Connector, Power, 10 Pin Round	0754000001
Q1	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 470, 5%, 1/4 W	0184110009
R2	Resistor, 27, 10%, 1/4 W	0172590001
R3	Resistor, 270, 10%, 1/4 W	0178450006
R4	Resistor, 39 K, 10%, 1/4 W	0177800003
R5	Resistor, 10 K, 10%, 1/4 W	0170410005
R6	Resistor, 1 K, 10%, 1/4 W	0171560001
R7	Pot., 1 K, 10%, 3/4 W, 1/8 Shaft	0346610001
R8	Pot., 1 K, 10%, 3/4 W, 1/8 Shaft	0346610001
T1	Transformer, Audio	0491590008
TB1	Barrier Strip, 3 Pos. 6-32	0542330008
	Switch Assy.	0346390095
	Switch Assy.	0346400091
	Knob, .50 D, Blk, W/D Br. Screw	0346420008
	Clamp, Cable 1/4 ID, 3/8 W	0501840001
	Bushing, Telescoping, .31 ID	0700550038
	Bushing, Telescoping, .44 ID	0700550046
	Bushing, Telescoping, .56 ID	0700550054
	Clamp, Cable, Connector	0740250001
	Panel, Front	50244005xx
	Panel, Rear	50244007xx
	Plate, Mounting	50244009xx
	Bar, Mounting	5024401000
	Plate, Cover	5024401 1xx

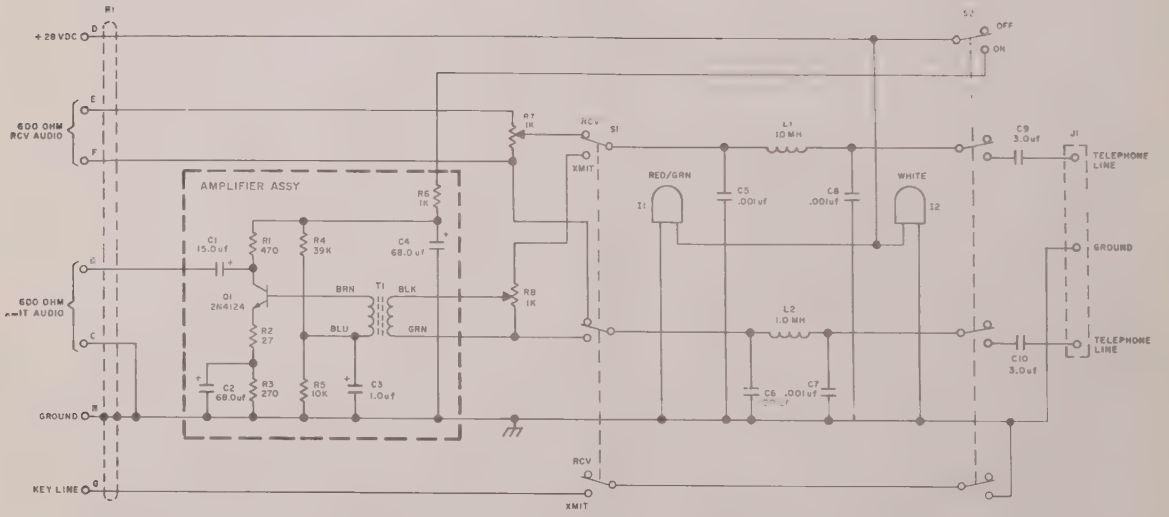


Figure 6.2 Manual Phone Patch Schematic Diagram

PANEL, FRONT

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.	
	Panel, Front	5024400500	
	Panel, Rear	5024400704	
	Plate, Mounting	5024400909	
	Bar, Mounting	5024401000	
	Plate, Cover	5024401107	
C5	Capacitor, Disc Ceramic, .001 UF, 250 V	0286260000	
C6	Capacitor, Disc Ceramic, .001 UF, 250 V	0286260000	
C7	Capacitor, Disc Ceramic, .001 UF, 250 V	0286260000	
C8	Capacitor, Disc Ceramic, .001 UF, 250 V	0286260000	
J1	Barrier Strip, 3 Terminal	0542330008	
L1	Inductor, 2 MHz	0653590008	
L2	Inductor, 2 MHz	0653590008	
P1	Connector, 10 Pin	0754000001	
R7	Potentiometer, Carbon, 1 K, 10%, 1/2 W	0346610001	
R8	Potentiometer, Carbon, 1 K, 10%, 1/2 W	0346610001	
S1	Switch, Illuminated, 4 PDT Red/Green, 28 V Bulb	0346400091	
S2	Switch, Illuminated, 4 PDT Wht 28 V Bulb	0346390095	
	Amplifier, Assembly (see separate parts list)	5024400097	GRN
		5024400054	GRY
	Cable, 7 Conductor	0604710003	
	Knob, Black	0346420008	
	Boot	0700550046	
	Boot	0700550038	
	Cable Clamp	0740250001	

PHONE PATCH AMPLIFIER ASSY.

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	Board, Printed Circuit	5024401697
C1	Capacitor, Tantalum, 15 UF, 20 V	0280920008
C2	Capacitor, Tantalum, 68 UF, 15 V	0296540005
C3	Capacitor, Tantalum, 1 UF, 35 V	0280910002
C4	Capacitor, Tantalum, 68 UF, 15 V	0296540005
Q1	Transistor, NPN, 2N4124	0448010003
R1	Resistor, Carbon, 470 ohm, 10%, 1/4 W	0184110009
R2	Resistor, Carbon, 27 ohm, 10%, 1/4 W	0172590001
R3	Resistor, Carbon, 270 ohm, 10%, 1/4 W	0178450006
R4	Resistor, Carbon, 39 K, 10%, 1/4 W	0177800003
R5	Resistor, Carbon, 10 K, 10%, 1/4 W	0170410005
R6	Resistor, Carbon, 1 K, 10%, 1/4 W	0171560001
T1	Transformer, Audio, 150 ohm to 600 ohm	0491590008

6.2 RECEIVER PROTECTOR 5024002491

6.2.1 GENERAL

The Receiver Protector is an instant shunt peak power limiter which prevents damage to the sensitive receiver "front end" of the GSB-900SC from high level RF signals picked up by the antennas. The option is recommended whenever there is a possibility of operating the GSB-900SC in the vicinity of other high powered transmitters as is often the case in shelter and marine installations. The protector requires no operating power and is therefore effective even if the receiver is disconnected from the power mains.

As operation of the protector is extremely rapid, it affords adequate protection against out-of-band signals well up into the microwave region. The option is installed in the filter module, 1A5 (see figure 5-28).

62.2.3 INSTALLATION

1. Remove the filter module, 1A5 from the GSB-900 SC.

2. Remove the 4 flat head screws on the sides of the filter module case and carefully slide the PC assembly out of the case.

3. Apply a thin film of thermal compound (Sunair #84041) to the mounting flange of each diode.

CAUTION

Do not apply excess torque.

NOTE

Since the diodes are connected across the coax, and one diode has its anode connected to its mounting stud while the other has its cathode connected to its stud, it does not matter which diode is mounted in which hole.

CAUTION

Use care not to apply excess heat to the diodes when soldering. Apply heat only to the top of the insulated terminals of the diodes. Because of the small size of the diodes, do not attempt to crimp the wires to the diodes, but, rather, lay the wires on the tops of the diodes and solder.

4. Reassemble filter module and replace in radio.

5. When assembly is complete, connect an ohmmeter such as a Simpson Model 260 on the RX1 range between the antenna jack and ground. The meter should indicate less than 20 ohms. Reverse the polarity of the ohm meter leads. Approximately the same reading should be obtained.

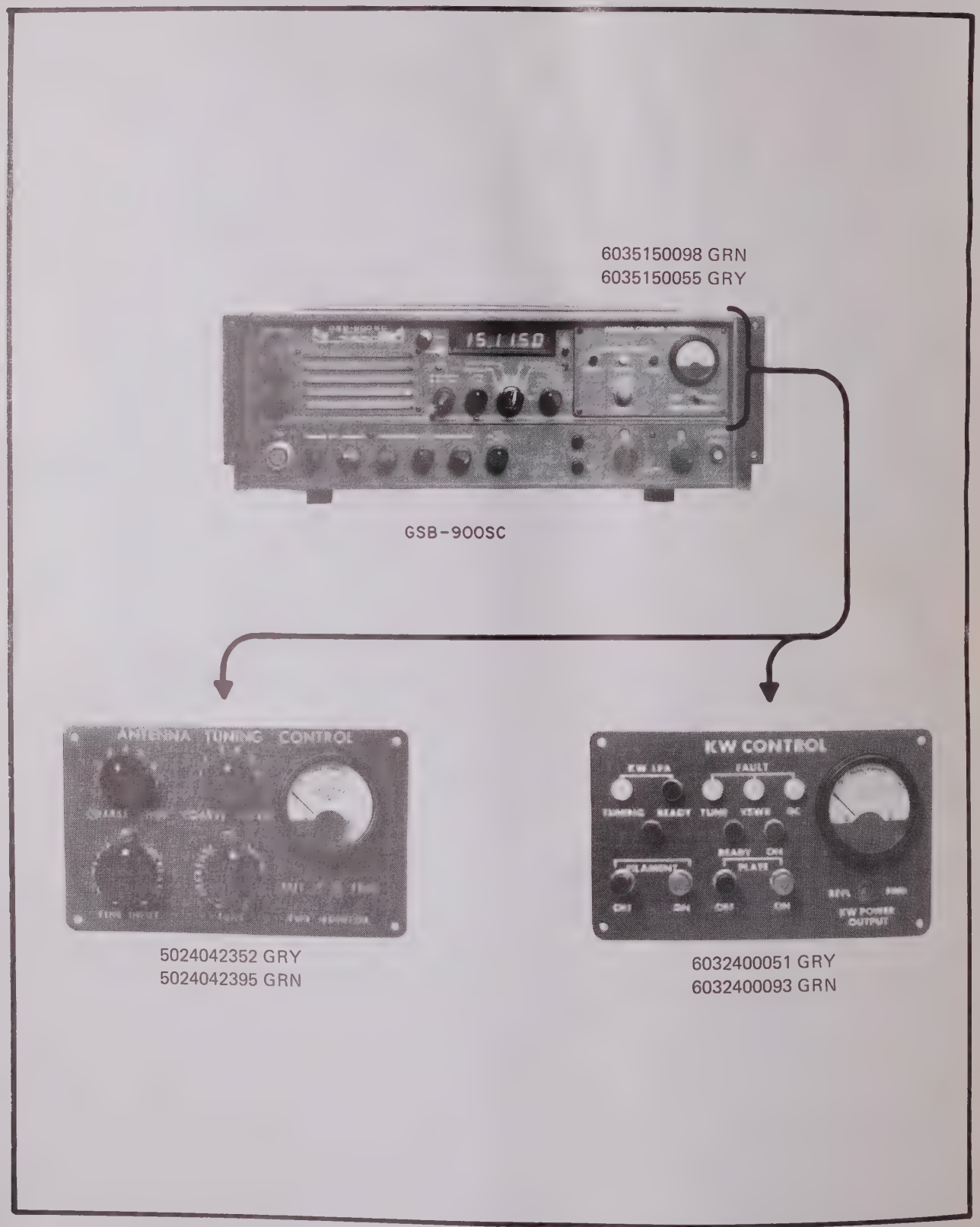


Figure 6.3 GSB-900SC Optional Antenna Tuning/Coupler/KW Control Panels

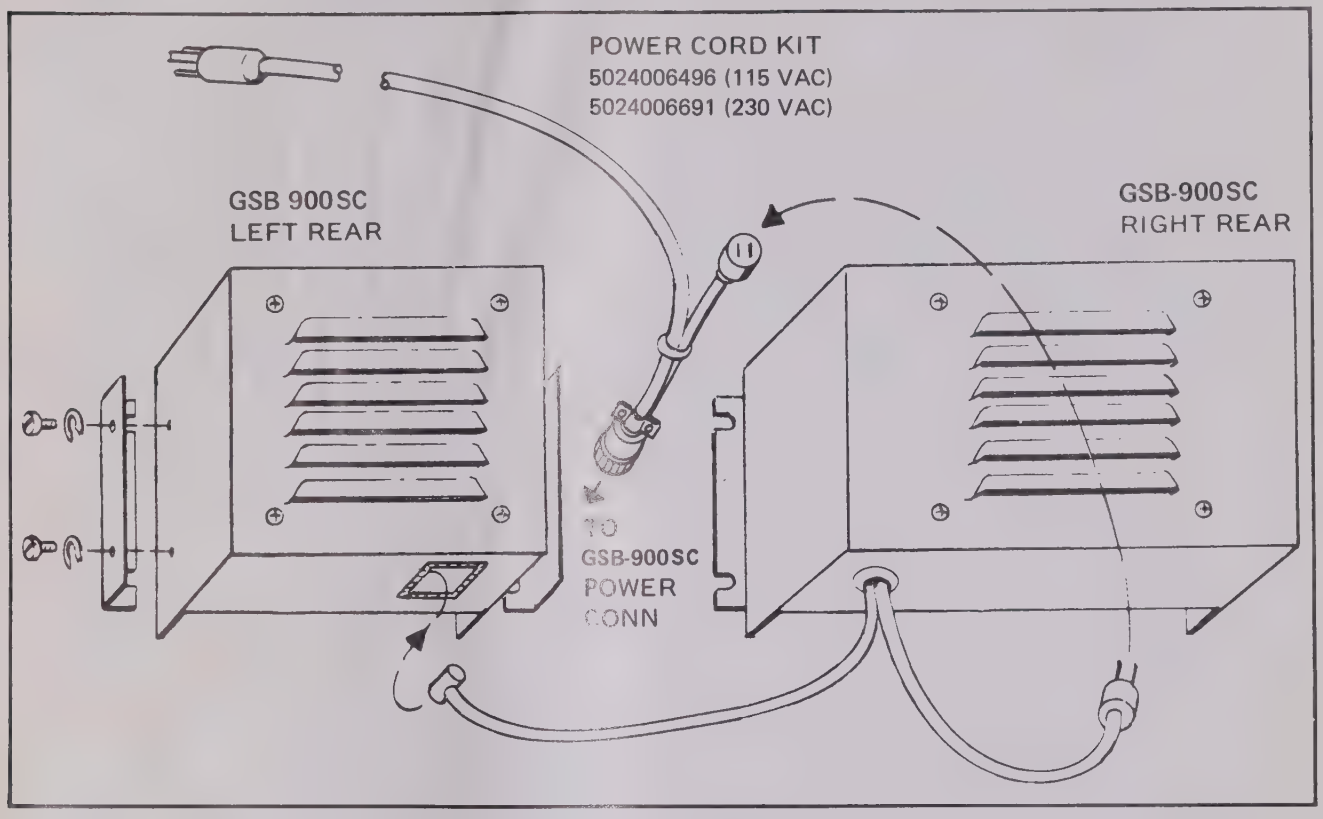
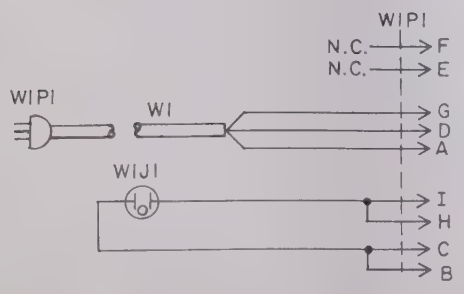
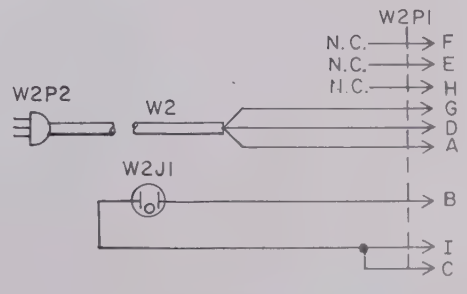


Figure 6.4 Blower Kit Installation Instructions

INSTALL SMALL BRACKETS TO POWER SUPPLY HEAT SINK (THE SMALLER ONE) THEN INSTALL SMALL BLOWER AND ENCLOSURE TO BRACKETS AS SHOWN. INSTALL LARGE BLOWER TO POWER AMPLIFIER HEAT SINK. CONNECT SMALL CORD TO CONNECTOR ON SMALLER BLOWER, THROUGH CUTOUT IN ENCLOSURE AS SHOWN. CONNECT POWER CONNECTOR (TWO PRONGED) TO SOCKET ON PIGTAIL FROM GSB-900SC POWER CONNECTOR. BLOWERS WILL BE ENERGIZED WHENEVER GSB-900SC POWER SWITCH IS TURNED ON.



5024006496 (115 VAC)



5024006691 (230 VAC)

6.3 GRC-951 AUDIO REMOTE CONTROL

Refer to figure 6.4

The receive audio from the remote 600 ohm audio of the GSB-900SC is applied to speaker driver U1 via remote control cable 0588690007. U1 is a hybrid integrated circuit audio amplifier identical to that used in the speaker driver, 1A1A1 (see section 4.3.5). On receive, the output of U1 is applied to speaker LS1 through relay K1. On transmit, K1 is energized and disconnects LS1 from the amplifier. Dummy load R3 is switched across the output of the amplifier to maintain the proper loading on the speaker driver.

On transmit, the audio from the microphone is amplified by Q1 and is applied to the 600 ohm audio input of the GSB-900SC via remote control cable 0588690007.

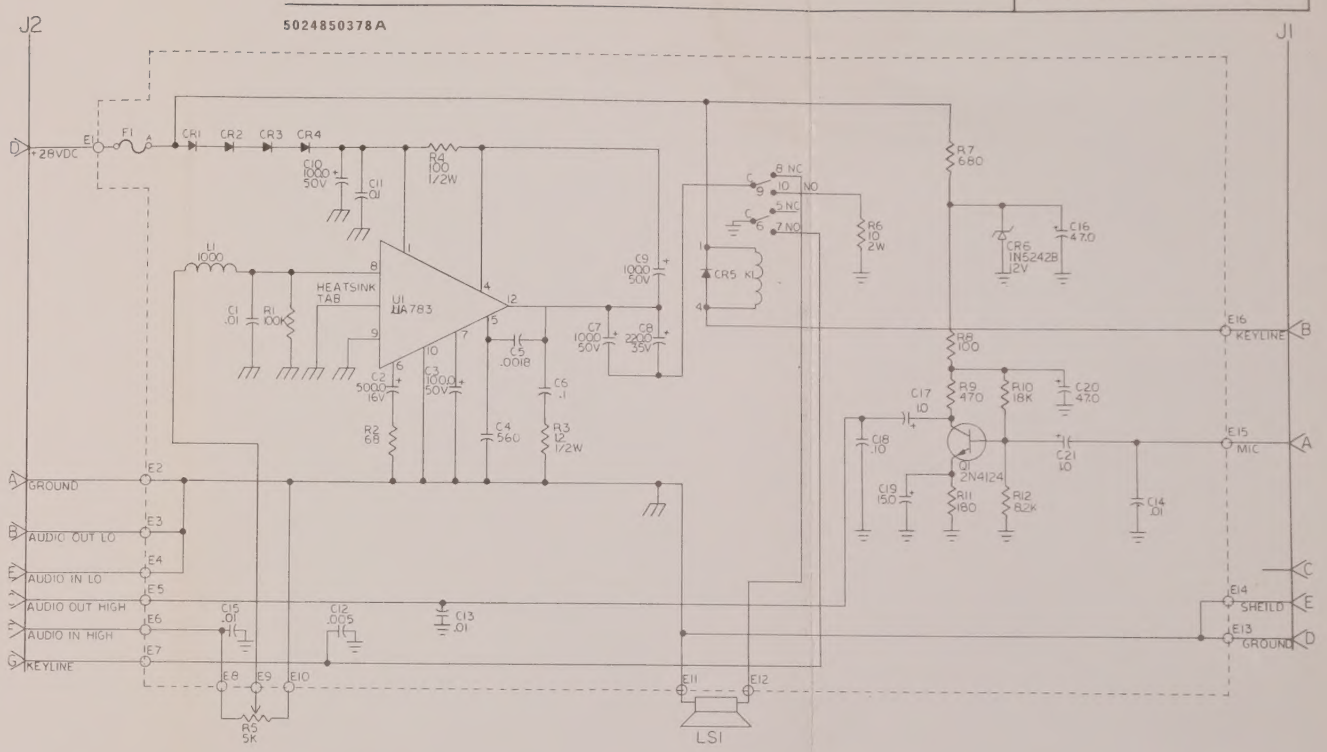
REFER TO SECTION 2.7 FOR INSTALLATION AND SYSTEM ADJUSTMENTS.

NOTES:
UNLESS OTHERWISE SPECIFIED
1.ALL RESISTERS ARE IN OHMS, 1/4W, 10%
2.ALL DECIMAL CAPACITERS ARE IN UF, OTHERS ARE IN PF.
3.INDUCTORS ARE IN MICROHENRIES
4.DIODES ARE 1N4004

HIGHEST USED DESIGN:							
R12	L1	F1	U1	E16	C21	CR6	Q1

CHASSIS ASSY W/PCB 50248505xxH

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	CHASSIS ASSY W/PCB	50248505xx
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 500 UF, 15 V, Br	0273070002
C3	Capacitor, 100 UF, 50 V	1004260016
C4	Capacitor, 560 PF, 300 V, DM15, 5%	0283750006
C5	Capacitor, 1800 PF, 100 V, X7 R, 10%	0288690001
C6	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C7	Capacitor, 100 UF, 50 V	1004260016
C8	Capacitor, 220 MF, 50 V	0282200002
C9	Capacitor, 100 UF, 50 V	1004260016
C10	Capacitor, 100 UF, 50 V	1004260016
C11	Capacitor, 0.1 UF, 50 V X7 R, 20%	0281610002
C12	Capacitor, 0.005 UF, 100 V, Z5 V	0273330004
C13	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C14	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C15	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C16	Capacitor, 47 UF, 20 V, 196 D	0281700001
C17	Capacitor, 1 UF, 50 V, 198 D	0280910002
C18	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C19	Capacitor, 15 UF, 20 V, 198 D	0280920008
C20	Capacitor, 47 UF, 20 V, 196 D	0281700001
C21	Capacitor, 1 UF, 50 V, 198 D	0280910002
CR1	Diode, Rectifier 1N4004	0405180004
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Rectifier 1N4004	0405180004
CR4	Diode, Rectifier 1N4004	0405180004
CR5	Diode, Rectifier 1N4004	0405180004
CR6	Diode, Zener 1N5242B	0400120003
K1	Relay, DPDT, 24 V, PC Mount	1005120013
L1	Inductor, Molded, 1000 UH, 5%	0643310002
Q1	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 100 K, 10%, 1/4 W	0170390004
R2	Resistor, 68, 10%, 1/4 W	0187960003
R3	Resistor, 1.2, 10%, 1/2 W	0188490001
R4	Resistor, 100, 10%, 1/2 W	0174790007
R5	Potentiometer, 5 K, 20%, 2 W, 1/4 Shaft	0346020000
R6	Resistor, 10, 10%, 2 W	0163840008
R7	Resistor, 680, 10%, 1/2 W	0167500007
R8	Resistor, 100, 5%, 1/4 W	0171180003
R9	Resistor, 470, 5%, 1/4 W	0184110009
R10	Resistor, 18 K, 10%, 1/4 W	0175720002
R11	Resistor, 180, 10%, 1/4 W	0175220000
R12	Resistor, 8.2 K, 10%, 1/4 W	0181620006
U1	IC Linear UA 783P	1004260024
	Fuseclip, PC Mount	0534610005
	Speaker, 3x5 Oval, 8 ohm, 5W	0877970009



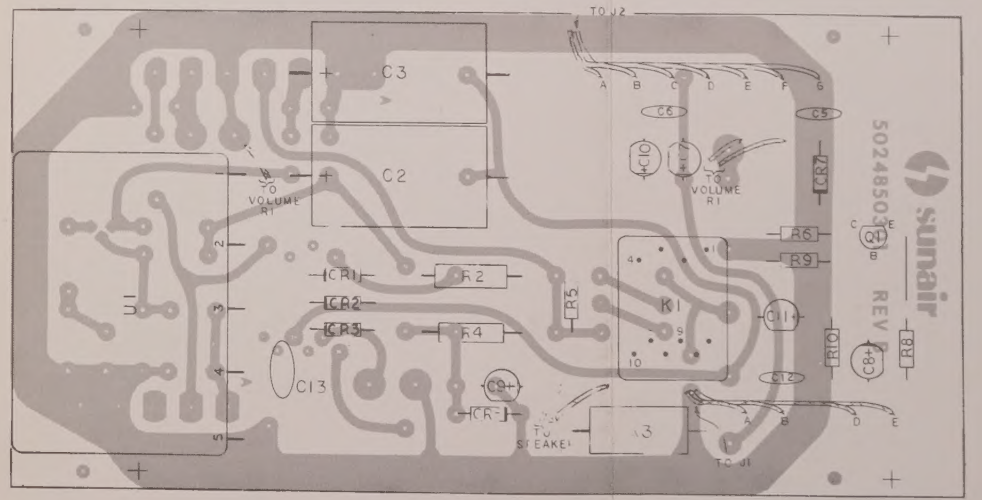


Figure 6.5 GRC-951 Audio Remote Control Unit

Ron Vollance - owns GSB 900
work- 1-613-925-2155
home - 1-613-925-2786

TM-1004190000

GSB-900SC

www.manualsplus.com
1034292

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